OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY

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BY

DR. RAJUL GOEL

SUPERVISOR

DR. RAJNISH GARG

DEPARTMENT OF ORTHOPAEDICS

DAYANAND MEDICAL COLLEGE AND HOSPITAL

LUDHIANA

(MAY, 2020)

DECLARATION

I declare that the thesis entitled **"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY"** has been prepared by me under the guidance of **Dr. Rajnish Garg,** Professor & Head, Department of orthopaedics, Dayanand Medical College and Hospital, Ludhiana. No part of this thesis has formed the basis for the award of any degree previously.

_____

Dr. Rajul Goel
Department of Orthopaedics
Dayanand Medical College & Hospital
Tagore Nagar
Ludhiana-141001
Punjab

Date:

CERTIFICATE

I certify that **Dr. Rajul Goel** has prepared his thesis entitled **"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY"** for the award of degree of M.S. in Orthopaedics of Baba Farid University of Health Sciences, under my guidance. He has carried out the work at the Department of Orthopaedics, Dayanand Medical College & Hospital, Ludhiana.

Supervisor

Dr. Rajnish Garg
Professor & Head
Department of Orthopaedics
DMCH, Ludhiana

Co-Supervisor

Dr. Pankaj Mahindra
Associate Professor
Department of Orthopaedics
DMCH, Ludhiana

Date:

ENDORSEMENT BY THE HEAD OF THE DEPARTMENT AND PRINCIPAL

This is to certify that the thesis entitled **"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY"** is a bonafide research work done by **Dr. Rajul Goel** under the guidance of **Dr. Rajnish Garg**, Professor & Head, Department of Orthopaedics, Dayanand Medical College & Hospital, Ludhiana.

Head of Department

Dr. Rajnish Garg
Professor & Head
Department of Orthopaedics
DMCH, Ludhiana

Principal

Dr. Sandeep Puri
Principal
DMCH, Ludhiana

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Dr. Rajul Goel
Department of Orthopaedics
Dayanand Medical College & Hospital
Tagore Nagar
Ludhiana-141001
Punjab

Date:

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Faridkot

Dedicated

To

My Family

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Dr. RAJUL GOEL……

ABBREVIATIONS

AMGP	Anterior Mid Glenoid Portal
AP	Antero-Posterior
TRUE AP	True Antero-Posterior View
ASP	Anterior Superior Portal
CBA	Cross Body Adduction
CHL	Coracohumeral Ligament
D	Discomfort
ER	External Rotation
ER1	External Rotation in Adduction
ER2	External Rotation in 90^{o}Abduction
FE	Forward Elevation
IGHL	Inferior Gleno-Humeral Ligament
IR	Internal Rotation
MAX	Maximum
MGHL	Middle Gleno-Humeral Ligament
MIN	Minimum
MRI	Magnetic Resonance Imaging
NP	No Pain
P	Pain
PMGP	Posterior Mid Glenoid Portal
SGHL	Superior Gleno – Humeral Ligament
VUS	Very Unstable

ABSTRACT

Introduction- Shoulder is the most common joint presenting with recurrent dislocation. Anterior shoulder instability, after episode of traumatic shoulder dislocation is fairly common. The advent of arthroscopic technique for anatomic surgery has made this procedure very successful with minimum complications.

Aims and objectives- To evaluate functional outcome after arthroscopic Bankart's repair in patients of anterior shoulder instability.

Material and methods- A prospective and retrospective review of the medical records of all cases of shoulder instability due to Bankart's lesion who underwent fixation between Jan 2016 and May 2019 at Dayanand Medical college Hospital, Ludhiana by single surgeon was performed. All patients were followed up for a period of 6 months .Post-operative evaluation was repeated at 1 month and 6 months.

Results- Pre-operative mean Rowe score of 45.6, improved on periodic rehabilitation of 3rd, 6th, 12weeks and 6 months, to a mean Rowe score of 77.8 at the end of 1 month and 96.3 by the end of 6 months. Association of Rowe score to post-operative outcome was found to be statistically significant (p 0.000).

Conclusion- We concluded that arthroscopic Bankart repair in recurrent anterior shoulder dislocation with suture anchors is effective in providing better shoulder function in terms of better range of movement and lower rate of recurrence.

Keywords- anchor sutures, glenoid, antero-inferior instability.

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INTRODUCTION

Shoulder dislocation is a problem affecting approximately 2% of people. Recurrent instability of the shoulder is the main complication of anterior gleno-humeral dislocation and it accounts for 74% recurrence rate in patients aged 20 - 40years.

The standard procedure for operative treatment of anterior gleno-humeral instability used to be open Bankart-type procedure, which closely restores normal anatomy. Recurrent instability rates with this type of procedure averaged around 7%. Despite these excellent results, there has been growing interest in the arthroscopic management of anterior gleno-humeral instability because of the advantages like less morbidity, less surgery time, less blood loss, improved range of motion, improved cosmetic results, and less post-operative pain and further low recurrence.

The purpose of present study is to evaluate functional outcome of the patients with recurrent dislocation of shoulder with Bankart lesion, treated with arthroscopic stabilization with suture anchors.

AIMS AND OBJECTIVES

- To evaluate functional outcome after arthroscopic Bankart's repair in anterior shoulder instability.
- To assess complications after arthroscopic Bankart's repair.

REVIEW OF LITERATURE

Anterior instability of shoulder with a Bankart lesion initially treated with open repair, as performed by Bankart himself, published by Dickson and Devas in 1957. With the evolution of shoulder arthroscopy in the last two decades, from a limited diagnostic modality to anterior instability with varying surgical tool, the arthroscopic stabilization for recurrent stabilizing techniques like trans-glenoid suture capsulorrhaphy, Bio absorbable tacks and the suture anchors, varying success is being reported.

J. W. Dickson and M. B. Devas in 1957 published a study of fifty cases of recurrent dislocation of the Shoulder, operated upon by Bankart and his colleagues from 1925 to 1954, concluded with a 4% failure rate.[1]

Wolf and associates in 1991 were the first to describe the use of suture anchors (Mitek, Westwood, Massachusetts) for arthroscopic shoulder stabilization.[2]

Bacilla and associates reported on a group of high risk patients who were managed with arthroscopic suture anchor stabilization, concluded with an impressive 7% recurrence rate in a study group that consisted of 40 young athletes and labourers.[3].

In a prospective study by Weber, where he compared arthroscopic suture anchor stabilization for the management of traumatic anterior glenohumeral instability compared with open Bankart repair concluded with 8% recurrence rate in the 40 patients who chose arthroscopic stabilization with decreased peri operative morbidity, increased external rotation, and an increased return to throwing sports, compared with 2% recurrence rate in the 92 patients who underwent open repair.[4]

Hoffmann et al reported a study of arthroscopic shoulder stabilization using mitek suture anchors in 30 patients followed up for a period of 24 months reported with a recurrence rate of 12% and concluded that increased failure with 10 or more dislocations preoperatively.[5]

Chin khoon Tan, Iinigo Guisasola, Bhuvaneshwar Machani concluded after conducting a prospective study in 130 patients with a follow up of 2 years,

Arthroscopic Bankart repair and stabilization with absorbable and non-absorbable suture anchors with re-dislocation rate of 6% and no significant difference between usage of absorbable suture anchor to non-absorbable suture anchor.

Nam Su Cho, Jung Chul Hwang, Yong Girl Rhee concluded after conducting a study to compare the results of arthroscopic anterior shoulder stabilization with collision and non-collision athletes with mean follow up period of 62 months, in 14 collision and 15 non collision athletes with recurrence rate of 6.7% in non-collision group compared with collision group with a high recurrence rate of 17.2%[6]

Bjourn Marquardt, Kai-Axel Witt, Christian Gotze et al concluded after studying the results of 18 patients who underwent arthroscopic Bankart repair using bio-absorbable tacks for traumatic anterior shoulder instability followed up for 8 years, that arthroscopic Bankart repair for the treatment of recurrent traumatic anterior shoulder instability repair using bio-absorbable tacks offers reliable results with respect to rate of failure (5.6%), range of motion and shoulder function during a 8 year follow.[7]

Tjoumakaris FP, Abboud JA, Hasan SA, Ramsey ML, Williams GR, compared arthroscopic Bankart repair with open Bankart repair retrospectively in 93 patients available for follow up out of 106 patients, with 69 arthroscopic Bankart repair and 24 open repair, following it up for a period of 24-77months,concluded with 1 patient from each group reporting with recurrence concluded that with the improvements in the techniques of arthroscopic Bankart repair in the modern days no difference in outcomes between the arthroscopic and open groups.[8]

J. Hobby, D. Griffin, M. Dunbar, and P. Boileau did a systematic review and meta-analysis of 62 studies including 3044 arthroscopic operations concluded that the failure rates are lessin arthroscopic stabilization using suture anchors and bio-absorbable tacks, compared to arthroscopic stabilization with staples and trans-glenoid suture technique. Arthroscopic

anterior stabilization using the most effective techniques has a similar rate of failure to open stabilization after 2 years of follow up.[9]

Godinho et al conducted a study to evaluate the clinical outcome of arthroscopic rotator cuff fixation and, when present, simultaneous repair of the Bankart's lesion caused by traumatic dislocation; and to assess whether the size of the rotator cuff injury caused by traumatic dislocation has any influence on the postoperative clinical outcomes. Thirty-three patients with traumatic shoulder dislocation and complete rotator cuff injury, with at least two years of follow up, were retrospectively evaluated. For analysis purposes, the patients were divided into groups: presence of fixed Bankart's lesion or absence of this lesion, and rotator cuff lesions smaller than 3.0 cm (group A) or greater than or equal to 3.0 cm (group B). All the patients underwent arthroscopic repair of the lesions and were evaluated postoperatively by means of the UCLA (University of California at Los Angeles) score and strength measurements. The group with Bankart's lesion repair had a postoperative UCLA score of 33.96, while the score of the group without Bankart's lesion was 33.7, without statistical significance ($p = 0.743$). Group A had a postoperative UCLA score of 34.35 and group B, 33.15, without statistical significance ($p = 0.416$).he functional outcomes of the patients who only presented complete rotator cuff tearing after traumatic shoulder dislocation, which underwent arthroscopic repair, were similar to the outcomes of those who presented an associated with a Bankart's lesion that was corrected simultaneously with the rotator cuff injury. The extent of the original rotator cuff injury did not alter the functional results in the postoperative evaluation.[10]

Bonnevialle et al conducted a study to evaluate mid-term outcomes of Bankart's repair with Hill-Sachs remplissage (BHSR) and to highlight prognostic factors of failure. Thirty-four patients operated on for anterior shoulder instability with BHSR were enrolled in a prospective non-randomized study. Clinical and radiographic evaluation was performed at 1.5, three, six months and yearly thereafter. Outcome measures included

Rowe and Walch-Duplay score. At mean follow-up of 35 months (24-63), the Rowe and Walch-Duplay scores reached respectively 92.7 and 88.2 points. The mean deficit in external rotation was 6° in ER1 and 1° in ER2 (p = 0.4, p = 0.9 respectively). Five patients (14.7%) had a recurrence of instability and three others had a persistent anterior apprehension. In the failure group, the Hill-Sachs lesion was deeper (26% vs 19% of the humeral diameter; p = 0.04) and range of motion at 1.5 months postoperatively was greater. Age at surgery, pre-operative instability severity index score (ISIS), hyper laxity, type and level of sport, amount of glenoid bone loss had no correlation with failure rate. The rate of failure at mid-term follow-up of BHSR was higher than commonly reported. The premature recovery of range of motion seems to be a clinical sign of failure at follow-up. Moreover, in case of deep Hill-Sachs lesion (>20%) an alternative procedure should be considered.[11]

Kalkar I et al conducted a study to evaluate the results of patients with recurrent anterior shoulder dislocation, who had been treated with repair of the Bankart's lesion without capsular plication. The study included 22 shoulders of 22 patients (16 males and 6 females) with a mean age of 28 years, who underwent Bankart's repair between 2011 and 2014. Patients with bilateral shoulder instability, multiple instability, >25% glenoid bone loss, and those with a history of shoulder surgery were not included in the study. The average follow-up time was 21.2 months. Evaluation was made of the preoperative number of dislocations, postoperative recurrence, functional status, and daily activity performance of the patients. Shoulder range of motion was measured. The results were evaluated using the Rowe shoulder score and the Oxford shoulder instability score. Recurrence was observed in only one patient who had a shoulder dislocation after trauma, thus giving a recurrence rate of 4.5%. Shoulder range of motion was full in all except that one patient. The mean Rowe shoulder score was 95.5 (excellent) and Oxford shoulder stability score was 44.6 (excellent). No recurrent shoulder dislocation was observed in patients who underwent

Bankart's repair surgery. Plication was not performed with the Bankart's repair. Close to full range of motion was obtained in all patients. In conclusion, Bankart's repair alone can be considered to be sufficient for the treatment of traumatic recurrent anterior shoulder instability.[12]

Erkoçak ÖF et al conducted a study to evaluate the functional results of arthroscopic Bankart's repair in patients with posttraumatic recurrent anterior glenohumeral instability .Forty one patients (6 female, 35 male; mean age 24.4; range 19 to 39 years) underwent arthroscopic Bankart's repair with knotless anchors for posttraumatic recurrent anterior glenohumeral instability. The mean age that first dislocation occured was 22.3 (range 16 to 36 years old). Involvement was on the right side in 27 patients, on the left in 14 patients, and on the dominant side in 32 patients. Pre and postoperative evaluations included detailed physical examination, assessment with the Rowe and Constant scale for shoulder functions, antero-posterior and axillary radiographs, routinely arthro-CT and arthro-MRI. Postoperatively the mean follow up was 29.8 months (range to 6 to 62 months). According to Rowe score, the results were excellent in 31 patients (75.7%), good in 6 patients (14.6%), fair in 3 patients (7.3%) and poor in 1 (2.4%) patients. The mean preoperative Rowe score was 20.1, which increased postoperatively 89.1. Preoperative mean Constant scale was 64.2 and 87.6 postoperatively. The mean preoperative active external rotation was 45°, which decreased postoperatively to 40° respectively ($p<0.05$). Thirty seven (90.2%) patients were satisfied with the operation. The patient with the poor result developed re-dislocation postoperatively seventh month due to epileptic seizure. This study shows arthroscopic Bankart's repair with knotless anchors for recurrent anterior glenohumeral instability is a useful and successful procedure.[13]

Carreira DS et al conducted a study To prospectively evaluate results of arthroscopic Bankart's repairs at a minimum 2-year follow-up for patients with histories of shoulder dislocation and an anterior-inferior labral tear at the time of diagnostic arthroscopy. A consecutive series of 85 patients (70

men, 15 women; mean age, 26 years) with Bankart's lesions were treated with arthroscopic repair using suture anchors; 18 patients (27%) had extension of the labral injury into the superior labrum affecting some or all of the biceps anchor. Anchors were loaded with no. 2 non-absorbable braided suture and placed 2 mm into the edge of the glenoid surface. A low anterior (5-o'clock) portal through the sub-scapularis tendon was used in all patients; 72 patients were evaluated at a minimum of 2 years postoperatively (mean, 46 months).Seven patients (10%) experienced recurrent instability after repair. Four patients had re-dislocations; 3 experienced recurrent sub-luxations. One patient had pain with the apprehension test without a clear history of recurrent instability. Of 18 collision athletes, 2 had dislocations at 22 and 60 months postoperatively. There were no complications, including no neurologic deficits. Clinical strength testing of the sub-scapularis muscle was normal in all patients. The mean Rowe score was 88 of 100 points, with 90% excellent or good results. Simple Shoulder Test responses improved from 66% positive preoperatively to 88% positive postoperatively. The American Shoulder and Elbow Surgeons scoring index averaged 92 of 100 points postoperatively. Pain analog scales improved from 5.5 preoperatively to 0.35 postoperatively on a 10-point scale. SF-12 scores improved for physical function. Patient satisfaction was rated 8.9 on a 10-point visual analog scale. Bankart's repairs performed arthroscopically using properly implanted suture anchors and non-absorbable sutures and in which associated patho-anatomy is addressed demonstrate low recurrence rates (10%) similar to historical open controls.[14]

INTRODUCTION

ANATOMY OF SHOULDER JOINT

The shoulder is a region of upper limb attachment to the trunk and neck. The bone framework of the shoulder consists of: The Clavicle and Scapula which forms the shoulder girdle and the proximal end of humerus.

Shoulder Joint (Glenohumeral joint):

The Glenohumeral joint is a synovial multiaxial spheroidal ball-and-socket joint between hemispherical head of humerus and a shallow glenoid fossa of the scapula.

Articulating surfaces:

It is between the large round to ovoid head of humerus and a small shallow glenoid cavity of scapula, which is approximately 4 to 1 disproportion in size respectively.

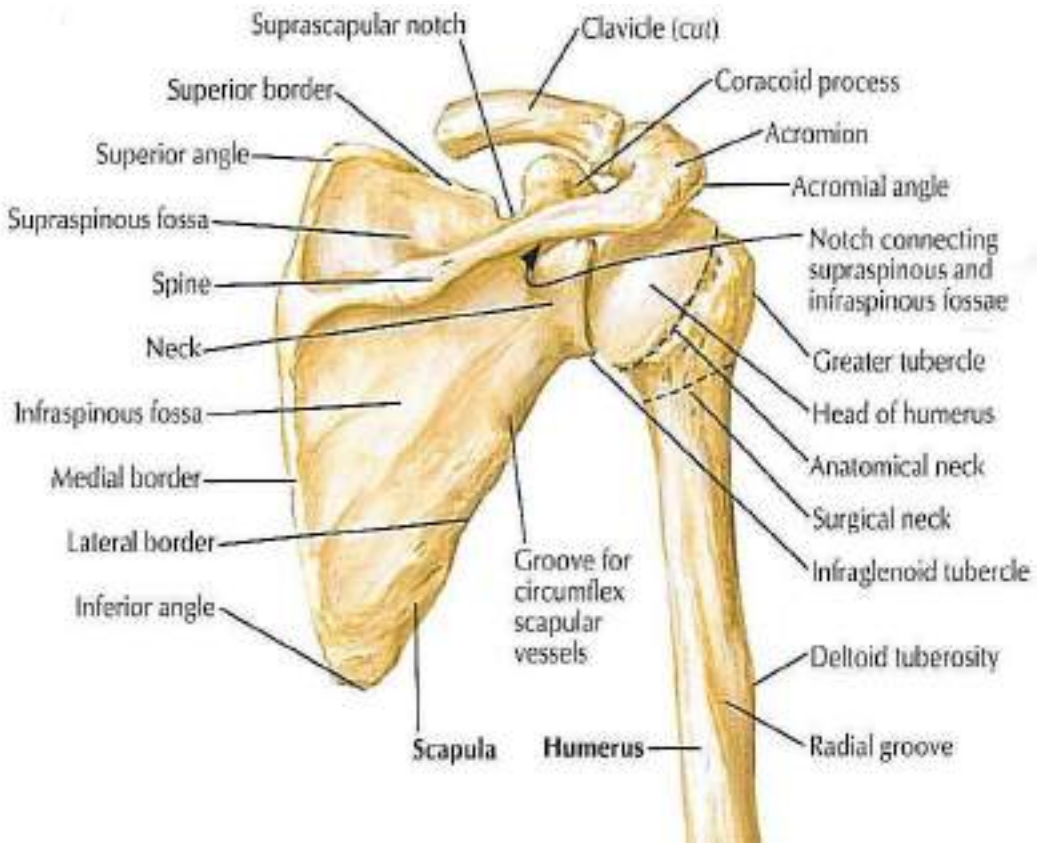
The area of humeral convexity exceeds that of the glenoid concavity such that only a small portion opposes the glenoid in any position.

Both articular surfaces are covered by hyaline cartilage, which is thickest centrally and thinner peripherally over the humerus, and the reverse in glenoid cavity.

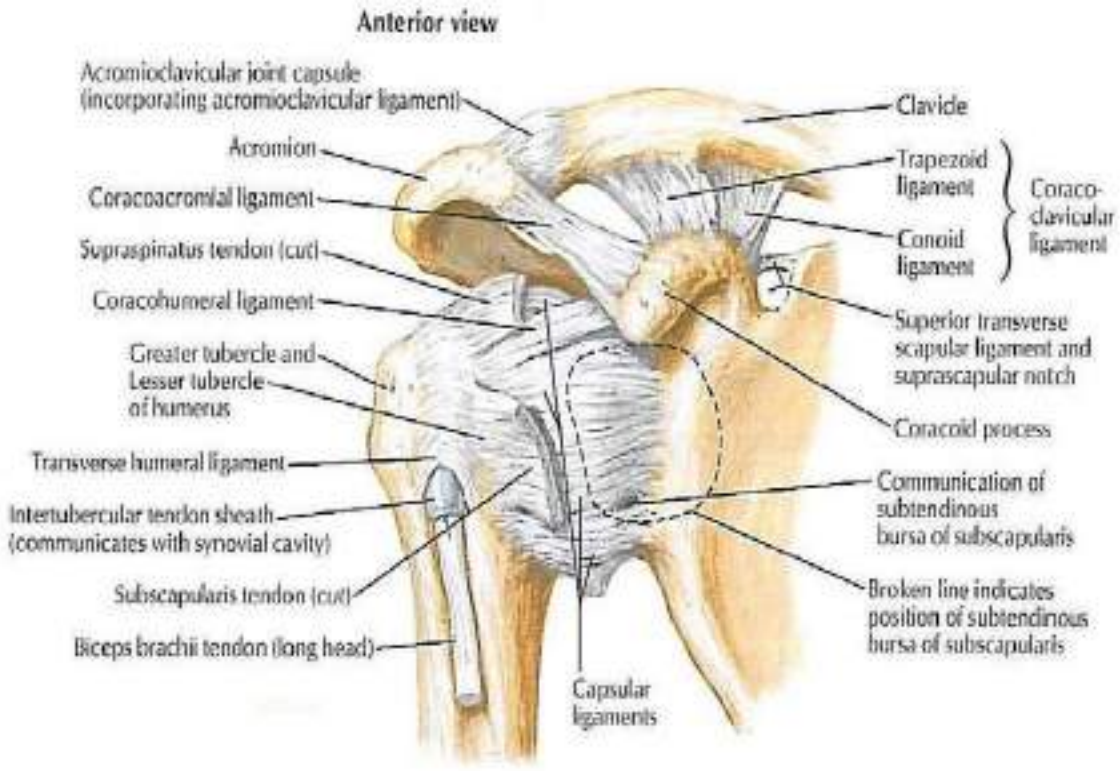
In most positions the curvature of the articular surfaces are not fully congruent and the joint is loose-packed. Close packing (full congruence) is reached with the humerus abducted and laterally rotated.

The above facts make the shoulder joint a highly mobile and a very unstable joint.

Anatomy of shoulder joint



PICTURE 1: ANATOMY OF SHOULDER JOINT



PICTURE 2: SHOULDER JOINT ANTERIOR VIEW

The mobility and stability is provided with the following structures:

Glenoid labrum:

It is a fibro-cartilaginous rim around the glenoid fossa, which is triangular in cross section.

Attachments:

Base attached to the margins of the fossa and its thin margin projects as a continuation of the curve of the glenoid. It blends above with a two fasciculi from the long tendon of biceps.

Functions and contribution to stability:

- It deepens the cavity
- It protects the bone and assists inlubrication.

Fibrous capsule:

- It envelops the joint

Attachments-

Medially, it is attached to glenoid margin, outside the glenoid labrum. It encroaches on the coracoid process to include the attachment of long head of biceps.

Laterally, it is attached to the anatomical neck of humerus, except infero-medially where it descends more than 1cm on humeral shaft.

The fibrous capsule is supported by the tendons of supra-spinatus from above, infraspinatus and teres minor from behind, sub-scapularis from front, long head of triceps from below. All but triceps blend with the capsule as a rotator cuff, which reinforces the capsule and actively supports. Triceps is separated from the capsule by the axillary nerve and posterior circumflex humeral vessels as they pass back from axilla.

Capsule is stretched anteriorly by extensions from the tendons of pectoralis major and teres major but the capsule is least supported inferiorly.

There are two to three openings in the capsule.

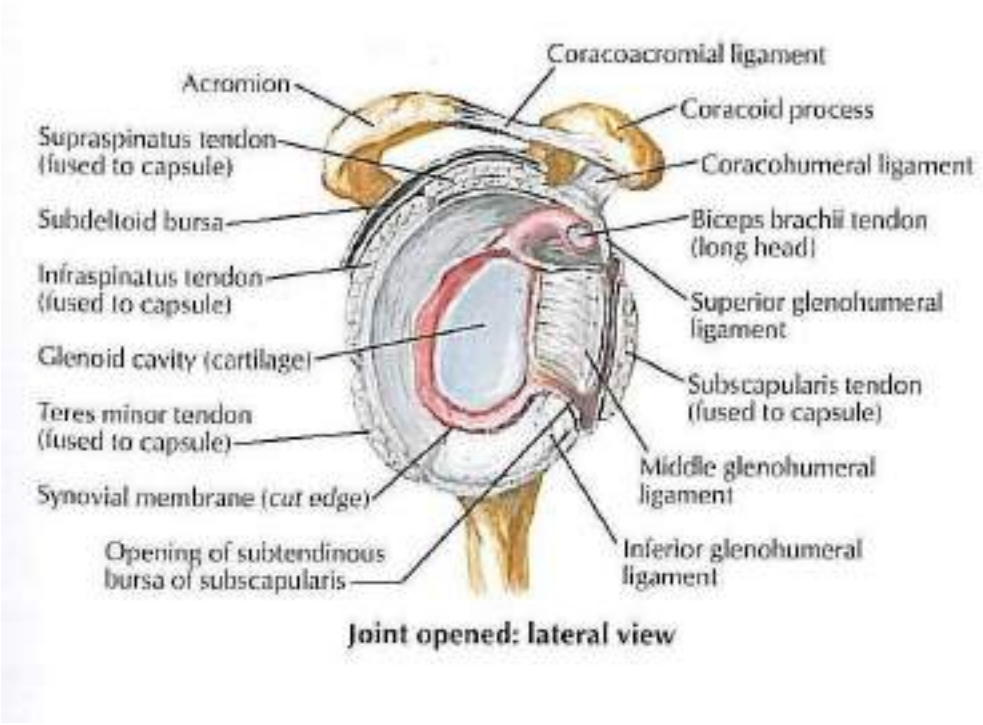
1. Below the coracoid process- connecting the joint to a bursa behind the tendon of sub-scapularis.
2. Between the humeral tubercles-transmitting the long tendon of biceps and its synovial sheath.
3. Connecting the joint to a bursa under the tendon of infraspinatus, which is posterior and inconsistent.

Functions:

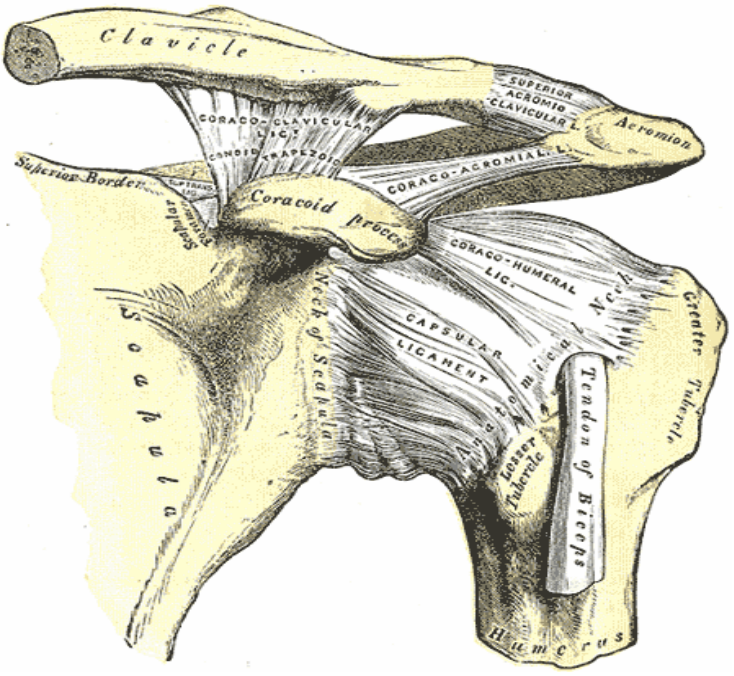
The capsule is thick and strong but it is lax. Because of the laxity which is obvious with the bones that can be distracted 2 to 3cm, which accords with the very wide range of movement possible at glenohumeral joint.

Ligaments:

1. Glenohumeral ligaments.
- Superior glenohumeral ligament
- Middle glenohumeral ligament
- Inferior glenohumeral ligament
2. Coracohumeral ligament.
3. Transverse humeral ligament.



Joint opened: lateral view

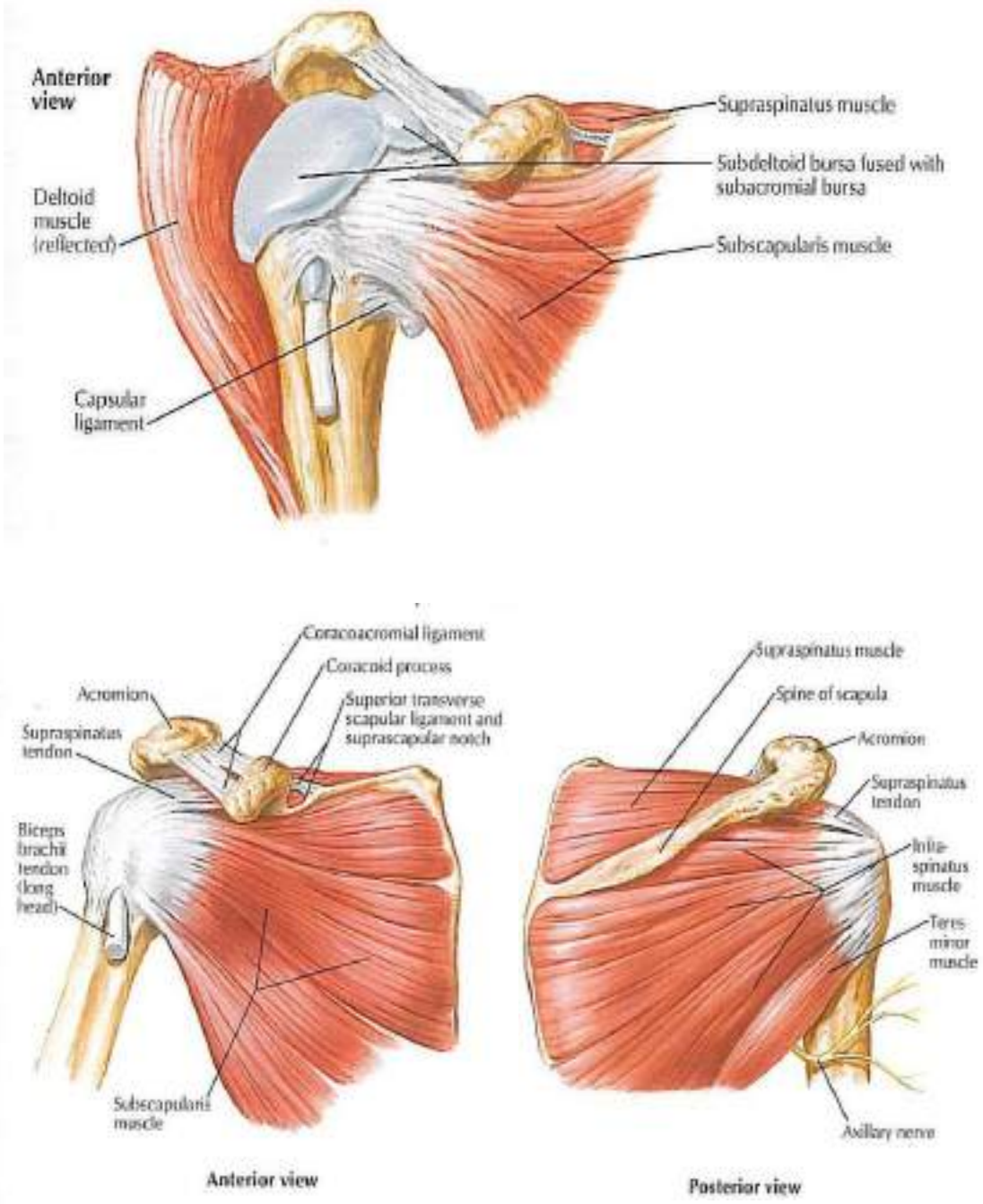


PICTURE 3: LIGAMENTS AROUND SHOULDER JOINT

Muscles around shoulder joint:

A group of six muscles converge from the scapula on to the humerus and surround the shoulder joint, namely,

- Deltoid
- Supraspinatus
- Infraspinatus
- Teresminor
- Teresmajor
- Subscapularis.



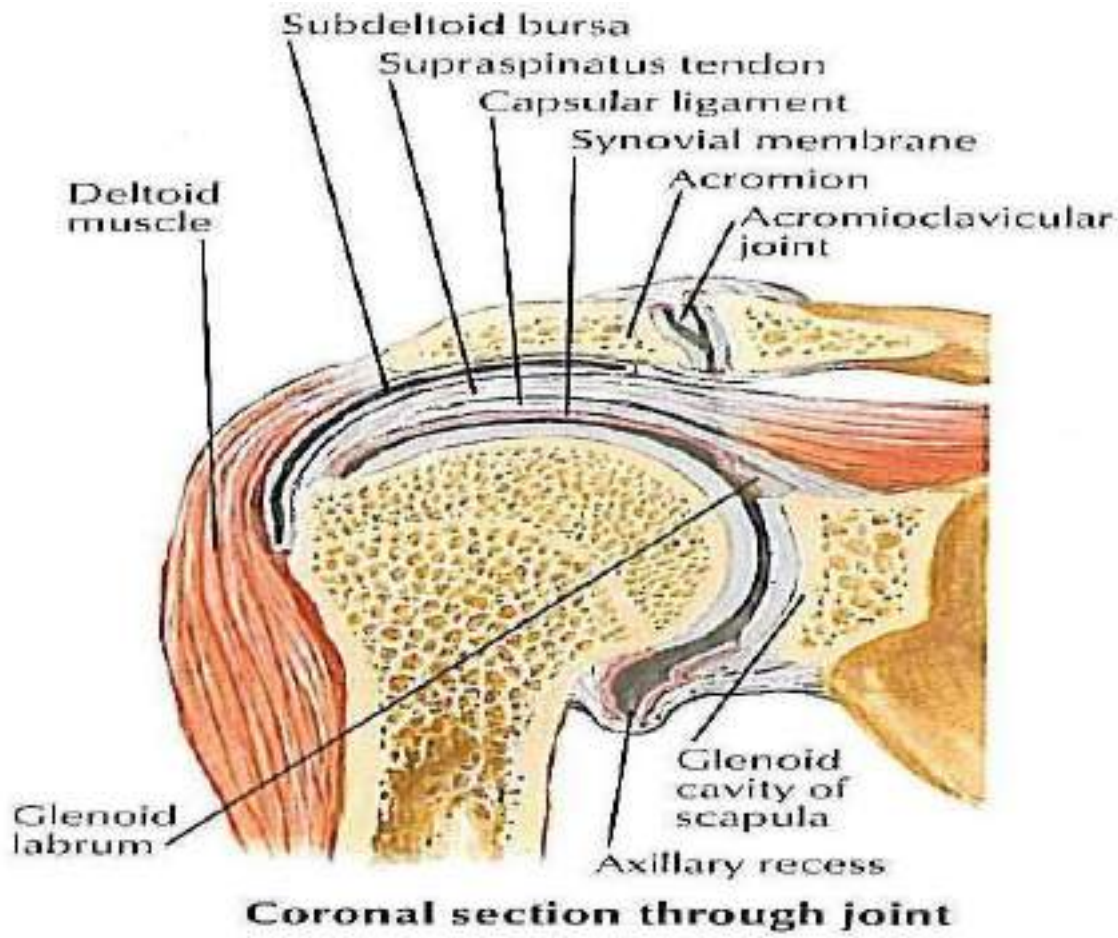
PICTURE 4: MUSCLES AROUND SHOULDER JOINT

Bursae:

Many bursae adjoining the shoulder joint usually found between the tendon of sub-scapularis and the capsule, communicating with the joint between the superior and middle glenohumeral ligaments.

Bursae exists between:

- The corocoid process and the capsule.
- Teres major and long head of triceps.
- Anterior and posterior to tendon of latissi musdorsi.



PICTURE 5: CORONAL SECTION THROUGH THE SHOULDER JOINT

Vascular supply of shoulder joint:

The glenohumeral joint is supplied by branches from the,

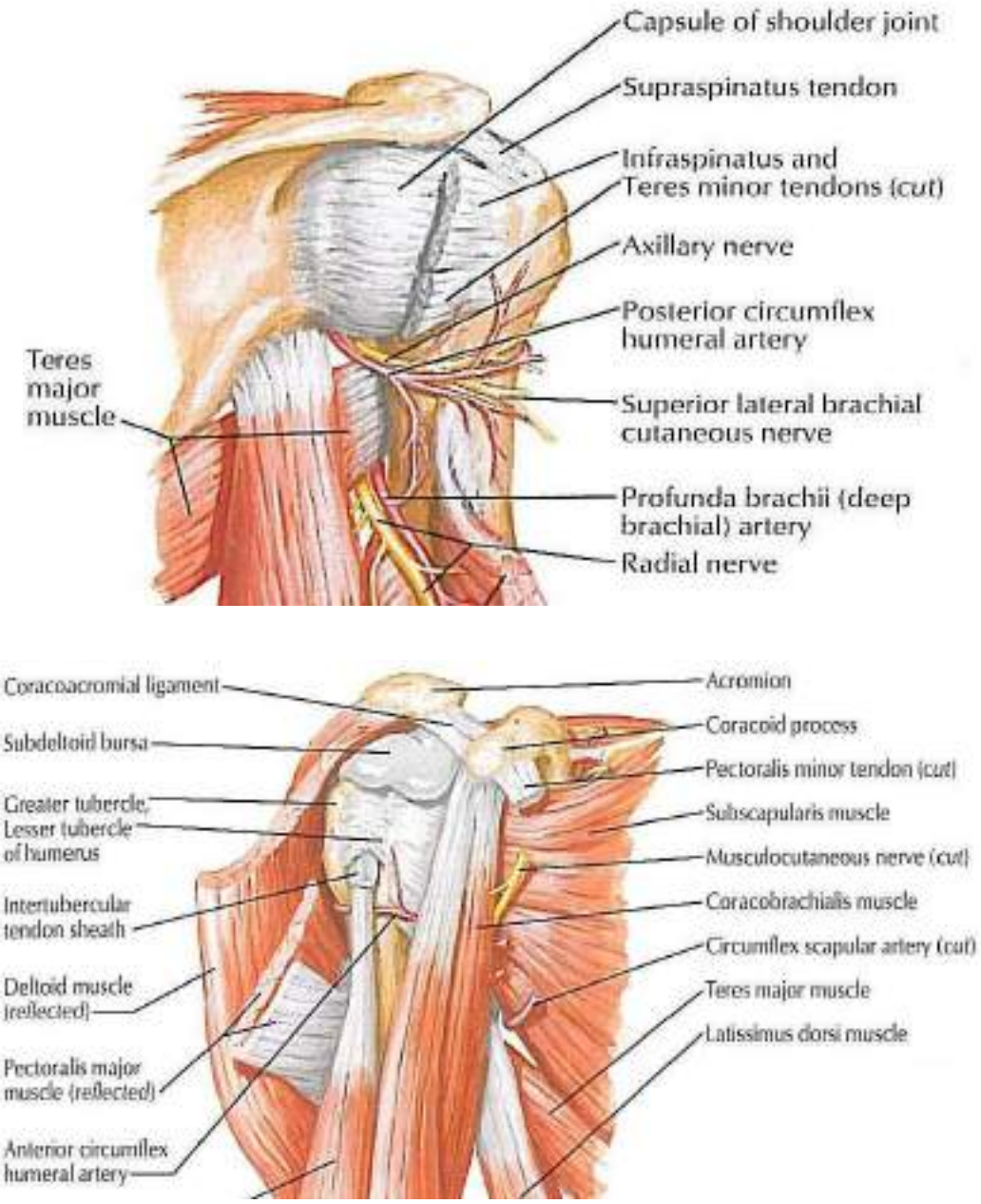
- Anterior and posterior circumflex humeral arteries
- Supra scapular vessels
- Circumflex scapular vessels

Nerve supply of shoulder joint:

Posterior cord of brachial plexus is the main innervations to shoulder joint.

Nerve Supply of Capsule:

- The posterior and superior parts supplied by Suprascapular nerve,
- The antero-inferior part by Axillary nerve,
- The antero-superior part by Lateral pectoral nerve.



PICTURE 6: VASCULAR SUPPLY OF SHOULDER JOINT

Anatomical factors maintaining stability

- The Joint capsule
- The Glenoidlabrum
- The Coraco-acromialarch
- The Rotator cuff

The Joint capsule: It is strong but lax.

The Glenoid labrum: It deepens the concavity of the articulating glenoid.

The Coracoacromial arch:

It constitutes corocoid process, acromion and Coracoacromial ligament, which prevents upward dislocation of humerus.

The Rotator cuff:

It is a musculotendinous cuff formed by the tendons of supra-spinatus, sub-scapularis; Infra-spinatus, teres minor collectively produces a compressive force during active glenohumeral movement. It also helps to maintain congruent contact between the head of humerus and the glenoid cavity. It helps to resist skid and checks excessive translation. It provides strong lateral stability and prevents the part of the capsule from being nipped during joint movement.

BIOMECHANICS OF SHOULDER

Shoulder biomechanics can be best approached through systematic examination of the stabilizing mechanisms of the glenohumeral joint. The multiple factors determining biomechanics of the shoulder can be broadly classified as:

- Static restraints

(1) Osteo-articular Geometry

(2) Capsulo-ligamentous structures

- Dynamic restraints

(1) Rotator Cuff Musculature

(2) Negative Intra –articular Pressure

Static Restraints:

(1) Osteo-articular Geometry

The glenohumeral joint lacks inherent bony stability due to articulation of the large humeral head in a shallow glenoid cavity, with a respective humeral head dimensions measuring antero-posteriorly 45mm and supero-inferiorly 48mm, in contrast to that of glenoid measuring 25mm and 35mm

respectively. The glenohumeral index, which is ratio of maximum humeral head diameter, has been determined to be within the 0.6 to 0.75 ranges, emphasizing the relative disparity between the areas of the articular surfaces of the humerus and glenoid. The use of stereo photogramme try by various workers established the glenohumeral contact remains essentially uniform during the range of shoulder motion, with 25% to 30% of the humeral head articular surface contacted by the glenoid surface.

The relative lack of depth and surface area of the bony glenoid dictate that other stabilizing mechanisms come into play.

The glenoid labrum, the fibrous ring of tissue encircling the bony glenoid plays a role in maintaining normal glenohumeral biomechanics. The presence of labrum significantly enhances the depth of the glenoid and the absence of the labrum results in a loss of approximately 50% of glenoid depth in both vertical and transverse directions. It has been proved that labrum increases the glenoid articular surface area and helps in load distribution.

Scapula lies at an angle of approximately 30ºrelative to the posterior thorax with an upward tilt of 3º relative to the transverse plane. Glenoid has an average 5º of superior tilt.

(2)Capsulo ligamentous structures:

Normal shoulder biomechanics maintained through the relative contributions of the glenohumeral Capsulo ligamentous structures including the superior (SGHL), middle (MGHL) as well as inferior glenohumeral ligaments (IGHL), Coracohumeral ligament (CHL) and posterior capsule.

The basis for the functional roles of the various capsular structures lies in their anatomic arrangement at the glenohumeral joint.

The Coracohumeral ligament after arising from the base of the corocoid and in part from the superior aspect of glenoid has a broad insertion over the anatomic neck of humerus. The superior glenohumeral ligament arising from the superior labrum and glenoid, inserts on the lesser tuberosity and

in the antero-superior portion of the capsule. The superior glenohumeral ligament (SGHL) and Coracohumeral ligament (CHL) run together in the rotator interval between the anterior margin of the supraspinatus tendon and superior margin of the subscapularis tendon.

The middle glenohumeral ligament arising immediately below the superior glenohumeral ligament on the antero-superior glenoid and labrum traverses the anterior capsule and inserts anteriorly on the humeral neck.

Inferior glenohumeral ligament comprising anterior and posterior bands and an axillary pouch spans the anterior and postero-inferior capsule.

Finally the thin posterior capsule alone occupies the postero-superior quadrant, with no additional ligamentous thickenings.

The subscapularis, middle glenohumeral ligament and inferior glenohumeral ligament maintain the anterior glenohumeral stability with increasing abduction angles.

“Circle concept” postulates the importance of posterior capsule to an anterior stability early in abduction.

Dynamic restraints:

The musculature around the shoulder provides the main compressive function keeping the humerus on the glenoid throughout the range of shoulder motion.

1. Rotator cuff musculature:

The movement of shoulder girdle represents the composite activity of approximately 30 muscles and the rotator cuff muscles in particular are considered the true dynamic stabilizers of the glenohumeral joint.

They act to prohibit abnormal humeral translation on the glenoid to allow normal shoulder motion. This function is accomplished through ‘muscle barrier effect’, ‘muscle bulk effect’, ‘concavity-compression effect’ from muscle activity.

2. Negative Intra-articular Pressure:

The role of negative intra-articular pressure has been documented many times to play an integral role in shoulder biomechanics. Loss of stability and inferior subluxation and significant inferior translation of humerus in the adducted shoulder.

PATHOPHYSIOLOGY OF SHOULDER INSTABILITY

Shoulder stability can be defined as the ability to maintain the humeral head perfectly centered within the glenoid fossa.

Shoulder instability can be defined as inability to maintain the head centered within the glenoid fossa.

Stability mechanisms:

This can be discussed under two headings

1. Mid range mechanisms
2. End range mechanisms

1. Mid range mechanisms:

There are several mechanisms of glenohumeral stability that although active in various degrees throughout the entire range, are most important in the mid range of motion.

The stability mechanisms are discussed in following headings

a. Concavity-Compression

The concavity-compression mechanism is an extremely effective glenohumeral stabilizer and it is most important mid range stabilizing mechanism. It also plays an important role in the end range of motion as well.

Golf ball placed on a tee can be related to the glenohumeral joint, once the golf ball placed on a tee, remains in place and remains stable. In situations like if the tee has a chip in its surface, the golf ball may no longer remain seated and if the tee were completely flat, it would be very difficult to keep the ball in place.

This same concept relates to the glenohumeral joint and has been termed 'Concavity-Compression'.

Two separate anatomic features give the glenoid a concave shape. Thickened chondral surface on the periphery of glenoid, providing the fossa with depth [15]

The contribution of the glenoid labrum to the depth of the glenoid fossa, since the labrum enhances the depth by 50 % [16]

b. Muscle Balance:

Cain et al[17] demonstrated in a dynamic cadaver shoulder model, that simulated contraction of the infra-spinatus and teres minor acted to decrease the strain in the inferior glenohumeral ligament by pulling the humeral head posteriorly. It is also shown that activation of biceps tendon in cocking stage of throwing has shown to reduce the inferior gleno humeral strain and help resist anterior humeral head translation. [18]

Muscle balance is clearly an important but poorly understood glenohumeral stabilizing mechanism.

c. Joint Congruity

Saha[19] classified the glenohumeral articulation into 3 types namely Type A where glenoid fossa with a radius of curvature greater than the humeral head, Type B where glenoid fossa and humeral head with equal radii of curvature and Type C where humeral surface with a greater radius of curvature than the glenoid and demonstrated most glenohumeral joints fall into Type B. Individuals whose glenoid surface is flattened with a radius of curvature greater than that of humeral head(saha Type A)then these individuals have difficulty keeping the humeral head perfectly centered and hence suffer from instability.

Flatowetal[20] using stereo-photogramme try showed that the flexible labrum acts to extend the surface contact area of the glenoid without altering its radius of curvature.

d. Glenohumeral Suction Cup:

When the humeral head is pressed into a compliant, confirming glenoid cavity, fluid is expressed from in between and a suction cup effect is produced. The valve for this suction is the glenoid labrum. Creating defect in the labrum in cadaveric studies proved complete elimination of the suction effect which is otherwise ranges 20 ± 3 newtons of force.

e. Negative Intra-articular Pressure/limited Joint Volume:

Kumar and Balasubramaniam[21] were first to measure the Intra-articular pressure in the shoulder which averaged -42cm H2O.Capsular venting can dramatically increase the amount of joint laxity and reduce the force necessary for humeral translation. When air or fluid is allowed to enter the glenohumeral joint, as occurs during arthroscopy or after injury, the humeral head easily displaces.

It is known that patients with generalized laxity due to poor capsular compliance often suffer from multidirectional instability[22]. The effectiveness of capsular shift procedures for atraumatic multidirectional instability occurs from limiting capsular volume[22].

f. Humeroscapular Balance and Proprioception

When the net humeral joint reaction force falls within the confines of the glenoid cavity, the joint will remain stable. Humeroscapular balance is linked inseparably with our proprioceptive ability to position the joint in a stable alignment. Improving the humeroscapular balance through muscle co–ordination training and Proprioception therapy will improve the abnormal scapular mechanics, hence the instability [22].

g. Adhesion-Cohesion Forces

When two congruent surfaces are wet and opposed, they resist separation. A similar mechanism exists in the glenohumeral joint. One to two ml of volume of viscous synovial fluid clings to the Intra-articular surfaces in a thick film. Any attempt to remove the fluid from the surface is resisted by its tenacious adhesive capacity. Any gap between the mating articular

surfaces is filled by synovial fluid when they are compressed by muscular contraction

2. End range mechanisms

(1) Glenohumeral ligaments and the Capsular constraint mechanism

(2) Musculotendinouswrap

Glenohumeral instability:

1. Traumatic Instability:
2. Atraumatic Instability

1. **Traumatic instability:**

It occurs when every stabilizing mechanism is overwhelmed and the humeral head is forcibly translated from its centered position in the glenohumeral fossa.

Traumatic dislocations occur when a loaded shoulder is suddenly forced beyond a protected limit and hence these are explosive and extremely destructive events. **'Essential Lesion' of traumatic antero-inferior glenohumeral instability**

Bankart lesion:

Perthes and Bankart originally described the detachment of the glenohumeral capsulolabral ligamentous junction from the anterior glenoid rim known by the name **'**Essential Lesion' leading to recurrent anterior dislocation. Surgical repair of this lesion remains the corner stone of the treatment.

Investigators claim that some degree of capsular ligaments train occurs with every traumatic antero-inferior dislocation and patients with recurrent anterior shoulder dislocations retained excessive residual laxity in the sub-scapularis tendon and anterior capsule, even though 'Katlas'[23]found a greater stretch capacity in the glenohumeral joint capsule than in other joints tested.

Recurrent traumatic instability has

- Loss of ligamentous stabilization, by the Inferior Glenohumeral Ligament deficiency
- Varying degrees of defects of glenoid concavity, from a normal ‘pear shaped’ to ‘inverted pear configuration’
- A decrease in the height of the thicker peripheral cartilage of glenoid and sometime fracture of the glenoidrim.

  The loss of concavity diminishes the effectiveness of all the mid range stabilizing mechanisms.

- Humeral bone loss such as ‘Hill Sachs’ or’ Reverse Hill Sachs’ impression fracture

The ultimate aim of the surgical treatment of Bankart’s lesion is

1.Reattachment of the labrum to the glenoid rim
2.Deepen the glenoid concavity
3.Restore the capsular ligament ousconstraint.

Atraumatic Instability:

The typical patient with Atraumatic instability does not have capsulolabral avulsion that is Bankart lesion, but instead may have increased capsular volume, increased capsular compliance, labral insufficiency, glenoid flattening, and neuromus cularimbalance.

The goal in treating Atraumatic instability, to re-establish stabilizing mechanisms without encroaching upon normal physiology.

Clinical Features

In the clinical discussive analysis, the following factors are important;

- The history and analysis of symptoms
- Physical examination and Specific tests
- Examination under general anesthesia.

History:

The age when the symptoms like shoulder pain, discomfort, apprehension began detailing the mechanism of initial injury like high energy traumatic events like motor vehicle accidents, minimal traumatic events like throwing or swimming, or Atraumatic event such as combing hair is important to get a clue into the problem.

Position of the arm during dislocation, and direction of the force will help to predict the direction of instability.

Important information like, number of episodes of dislocation, the ease of relocation, the frequency with which it occurs. Prior treatment of any dislocation, if patient immobilized after reduction, and then the duration and subsequent rehabilitation should be detailed.

Volitional control over the instability should be addressed. Identification of habitual dislocator, who dislocates for secondary gain, can have an important impact on prognosis.

Further questioning to exclude other causes of shoulder pain like radiating pain from the neck, may be secondary to cervical spine diseases. Referred pain from hand may be secondary to compressive neuropathy.

Physical Examination

General principle:

Overall evaluation of musculoskeletal system through a systematic approach of inspection, palpation, range of motion analysis, strength testing, neurological evaluation, shoulder stability assessment and specialized testing.

Visual inspection:

Deltoid atrophy and weakness evaluation to rule out injury to axillary nerve during recurrent dislocations or relocations

The Sulcus Sign: Visible depression inferior to the lateral edge of the Acromion. Winging of scapula evident in patients with anterior or posterior sub-luxation.

Palpation:

The shoulder girdle palpated for local tenderness and muscle tone.

Patients with anterior sub-luxation often have tenderness over the posterior capsule.

Patients with anterior instability caused by subluxation and secondary impingement may have tenderness over the greater tuberosity or biceps tendon.

Range of Motion:

Both active and passive range of motion recorded.

Forward flexion (Forward elevation) -normal range(0-165º)

Abduction –normal range(0-170º)

Adduction -normal range(0-50º)

Internal rotation in abduction of 90º-upto 70º

External rotation in abduction of 90º -upto100º

Dyskinesia and accessory muscles acting noted .Crepitations occurring on Range of Motion testing recorded. While assessing the range of motion, strength of the muscles bringing about pain- free range of motion recorded. The results are compared with normal side.

Generalized ligamentous laxity may be associated with shoulder instability; this is assessed by evaluating range of motion in several joints. The degree of thumb hyper extension with volar flexion of wrist as well as index finger, elbow and knee hyperextension noted.

Specific tests:

The examination should first be initiated on the unaffected shoulder to obtain baseline data for each subsequent test and also to make patient comfortable with each maneuver.

Two components are considered when assessing the stability of the glenohumeral joint

1. The amount of passive translation of the humeral head and glenoid fossa on stress testing

2. Attempts to reproduce the symptoms of subluxation and apprehension by provocative testing of the shoulder in positions of compromise.

Translation tests (Load and Shift):

Glenohumeral translation can be evaluated in both the upright and supine positions. The Load –and –Shift test establishes clinically significant translation of the humeral head is possible and if this translation reproduces the patient's symptoms.

Procedure:

Patient in sitting position:

The examiner stands behind the seated patient with one hand on the affected shoulder. The other hand holds the proximal humerus with the thumb on the posterior aspect of the humeral head and the index finger on the anterior aspect.

The initial movement is to load the humeral head into the glenoid fossa, reducing the inherent sub-luxation. Then the examiner attempts to shift the humeral head in anterior, posterior and inferior directions while observing the area adjacent to the acromion for a sulcus sign.

Patient in supine position:

The patient is positioned such that the centre of the scapula rests on the edge of the examination table to eliminate a portion of scapulo-thoracic motion. The examiner grasps the humerus in 20º of abduction and forward flexion (the plane of the scapula) with neutral rotation. The humeral head is loaded and then stressed anteriorly, posteriorly and inferiorly while the examiner notes the amount of excursion.

The amount of excursion graded based on the degree of humeral head translation relative to the glenoid:

Grade 0-minimal movement

Grade 1+-humeral head rides up on to the labrum (greater than contra lateral side)

Grade 2+ - humeral head sub-luxated but spontaneously reduces.

Grade3+ - humeral head dislocates and remains dislocated.

The reproduction of patient's symptoms during the translation tests confirms instability in the corresponding direction.

Apprehension test[24]:

The apprehension test places the shoulder in a provocative position of abduction and external rotation in an attempt to reproduce the patient's sensation of impending sub-luxation or dislocation.

The test is performed in both supine and seated positions.

Procedure:

Test in patient in sitting position:

The examiner stands behind the seated patient, raises the patient's arm to 90º of abduction, and begins to externally rotate the humerus. The hand of the examiner is placed over the humeral head with the thumb pushing the posterior aspect of the humeral head for extra leverage. Fingers are placed anteriorly to control any sudden instability that might occur. With the increasing external rotation and controlled gentle forward pressure exerted against the humeral head, the patient may have an apprehensive feeling of impending instability.

The patient communicates this apprehension verbally or by facial expression, or by protectively contracting the shoulder muscles.

Performing the test in supine position:

This test is more easily performed in supine position because the scapula is stabilized against the edge of the examining table, giving the examiner more control over the maneuver.

The edge of the table acts as a fulcrum and the arm acts as a lever. As the humeral head is levered anteriorly, the amount of external rotation required to produce apprehension is noted.

Jobe et al[25] described as pain as the only positive finding in apprehension testing especially in evaluating throwing athletes. Pain is suggestive of anterior subluxation, even in the absence of apprehension.

Relocation test:

The relocation test[25] should be performed in conjunction with the apprehension test.

Procedure:

With the arm in the position that produces apprehension, a posteriorly directed stress is exerted on the proximal humerus. Both the apprehension and pain should disappear with this maneuver. This test presumably reduces the subluxation by pushing the humeral head posteriorly and thus relieving the symptoms.

PICTURE 7: APPREHENSION TEST

PICTURE 8: RELOCATION TEST

Diagnostic Arthroscopy:

Diagnostic arthroscopy provides a precise diagnosis of the type of instability and associated injury, which also makes it an systematic approach dealing with suspected shoulder instability.

Procedure**:** After anesthetizing the patient with general anesthesia, Patient put in semi beach chair position.

The basic diagnostic procedure consists of visualizing and video recording all of the anatomical features in the glenohumeral joint and Subacromial space from the anterior and posterior portals. A stepwise 15 point checklist in the glenohumeral joint evaluated.

Ten steps of 15 point glenohumeral anatomy includes

Visualizing from the Posterior *Portal*

1. Biceps tendon and superior labrum
2. Posterior labrum and capsulerecess
3. Inferior axillary recess and inferior capsular insertion to the humeral head
4. Inferior labrum and glenoid articular surface
5. Supraspinatus tendon of the rotator cuff
6. Posterior rotator cuff insertion and bare area of the humeral head
7. Articular surface of the humeral head
8. Anterior superior labrum, superior and middle glenohumeral ligament
9. Anterior inferior labrum.
10. Anterior inferior ligament.

Visualizing from the Anterior Portal

11. Posterior glenoid labrum and capsule insertion into the humeralhead
12. Posterior rotator cuff, including Infraspinatus and the supraspinatustendons
13. Anterior glenoid labrum and inferior glenohumeral ligament attachments to humeralhead.

14. Subscapularis tendon and recess and middle glenohumeral ligament attachment to the labrum
15. Anterior surface of humeral head with subscapularis attachment and biceps tendon passage through the rotator interval.

INVESTIGATIONS

Radiographic evaluation:

Routine radiological examination are essential to exclude the associated bone or soft tissue calcification adjacent to anterior and antero-inferior rim of glenoid.

Initial plain film evaluation of the shoulder include a true Antero-Posterior (AP) view

True Antero-posterior view:

Position:

The patient may be supine or erect, with the arm at the side or in the sling position.

X- ray beam angled 45 degrees from medial to lateral

An alternative technique is to rotate the patient until the scapula is flat against the x-ray cassette and then take the x-ray with the beam perpendicular to the scapula.

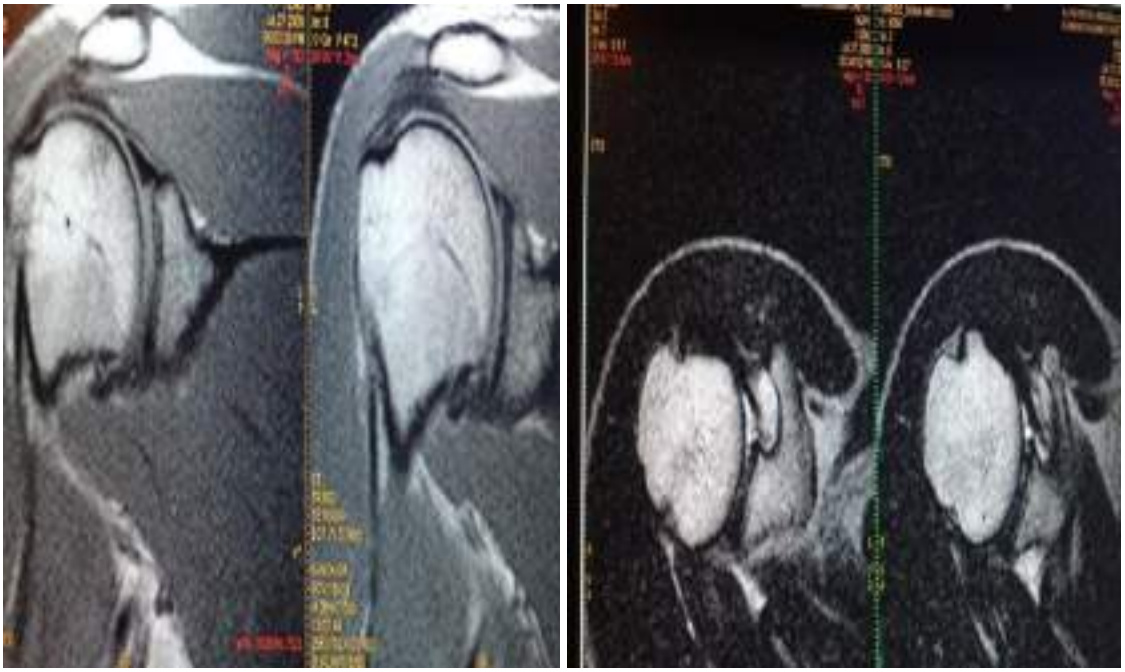
Advantages:

It demonstrates the glenoid in profile rather than obliquely. It clearly separates the glenoid from humeral head.

INVESTIGATIONS

PICTURE 9:

X-RAY EXAMINATION – TRUE ANTEROPOSTERIOR VIEW (TRUE AP)



PICTURE 10: MRI EXAMINATION OF THE SHOULDER

Advantage:

The resultant x- ray demonstrates antero-inferior calcification or fractures of glenoidrim

Glenohumeral dislocation

Postero-lateral humeral head compression fractures.

Magnetic Resonance Imaging:

Magnetic Resonance Imaging is superior to other imaging studies with respect to no exposure to ionizing radiation, excellent soft tissue resolution, non-invasiveness and ability to image in multiple planes.

Magnetic Resonance Imaging defines

- Labral and Capsuloligamentous pathology
- Additional shoulder pathology such as rotator cuff tear can be demonstrated
- Congenital and age related variations in the anterior labrum
- Complex labral tears, capsular stripping from the glenoid
- Muscle atrophy caused by Suprascapular and axillary nerve injury.
- Bony lesions such as Hill-Sachslesions.

MANAGEMENT

The goal of management of anterior shoulder instability is to return the patient as rapidly as possible to his or her pre-injury level of activity.

1. Non operative Management
2. Surgical management

1. Non operative management

Non operative management, although controversial, begins with shoulder immobilization followed by physical therapy and bracing.

Indications:

1. Atraumatic instability
2. Voluntary instability

3. Children with instability
4. Selected athletes whose sports requires supra-physiologic motion at the glenohumeral joint.

2. Surgical management:

Significant advances in open surgical and arthroscopic management in the basic science principles of shoulder biomechanics and operative techniques resulted in decrease in recurrence rates with return to the pre-injury activity including overhead sports activity.

Indications:

1. Irreducible, open or recurrent dislocation
2. Failed non operative treatment in young patient
3. Failed procedures with significant glenoid or humeral head defects.

Surgical options:

1. Open Bankart repair:

The open Bankart surgical stabilization technique for post traumatic, recurrent anterior instability has become the procedure of choice for patients who donot respond to non-operative treatment[26]. The Bankart repair as described by Rowe et al[27] involves suturing the avulsed capsulolabral complex to the anterior glenoid rim through curved drill holes. In recent years the use of suture anchors has made the procedure technically simpler without negative effects on the results in terms of shoulder stability[28].

Limitation in range of motion, especially external rotation, is one of the major drawbacks in terms of functional outcome after open Bankart reconstruction. [29]

2. Arthroscopic Bankart repair

The first arthroscopic stabilization procedure was described in 1993 and involved the use of metal staple[30] with a high recurrence rate and restriction of external rotation and high risk of implant failure such as loose

staple. Since then several studies publishedreporting on different arthroscopic techniques for shoulder stabilization improving the outcome, minimizing the complications.

The advantages of the arthroscopic Bankart repair include

- Selective repairs of Bankart lesion without any damage to normal adjacent tissue such as the subscapularistendon.
- Can be performed as day care surgery because of less post-operative pain.
- Arthroscopic Bankart repair using suture anchor technique for traumatic anterior instability is a reliable procedure with respect to shoulder function, recurrence rate, range of motion and post-operative sports activity inathletes

Types of arthroscopic Bankart repair and stabilization:

- Arthroscopic Bankart repair and stabilization with absorbable and non-absorbable sutureanchors
- Arthroscopic Bankart repair and stabilization using Bioabsorbabletacks
- Arthroscopic Bankart repair and stabilization with staples and transglenoid suture technique

MATERIALS AND METHODS

SOURCE OF DATA

A prospective and retrospective review of the medical records of all cases of shoulder instability due to Bankart's lesion who underwent fixation between Jan 2016 and May 2019 at Dayanand Medical college Hospital, Ludhiana by single surgeon was performed.

METHOD OF COLLECTION OF DATA

Inclusion criteria:

- Recurrent anterior glenohumeral subluxation or dislocation after an initial Episode of traumatic anterior shoulder dislocation,
- A Bankart's lesion confirmed by arthroscopic examination or ultrasound or magnetic resonance imaging (MRI)
- Arthroscopic Bankart's repair done using suture anchors.

Exclusion criteria:

- Posterior instability
- Multidirectional instability,
- Procedures performed with open surgery
- Patient who did not consent for surgery
- Patient who did not follow up.
- Patient managed conservatively

After getting the clearance from ethical committee for the study from our institution, necessary radiological investigations and hematology done on admission. Patients were operated at DMC Ludhiana, with arthroscopic suture anchor stabilization. Evaluation done during the hospital stay and the rehabilitation phase. The surgical and functional outcome assessed during this period.

Type of surgery and details noted. The immediate post-operative x-rays evaluated. The post-operative rehabilitation evaluation post operatively, at

1 month and 6 months, with follow up questionnaire included subjective rating of pain, mechanical symptoms like any limitations of work. [31]

The physical examination included range of movement, instability testing including apprehension test, relocation tests. Patients were rated using Bankart scale described by Rowe et al[32]

STUDY TYPE

Descriptive, Retrospective and Prospective study of surgical and functional outcome following, arthroscopic repair of the Bankart lesion of the shoulder with suture anchors.

SAMPLING AND SAMPLING TECHNIQUE

A sample size of 16 patients was selected using purposive sampling technique.

DATA ANALYSIS

Data were described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables was done using paired t-test and f-test. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21version statistical program for Microsoft Windows.

SURGICAL TECHNIQUE USED

Anesthesia: general anesthesia with endotracheal tube taped securely on the side opposite to side of surgery.

Patient positioning: After inducing the patient under general anesthesia patient was put in semi beach chair position.

A video recorded Arthroscopic evaluation done before the therapeutic arthroscopy to assess and document the range of motion and degree of instability present.

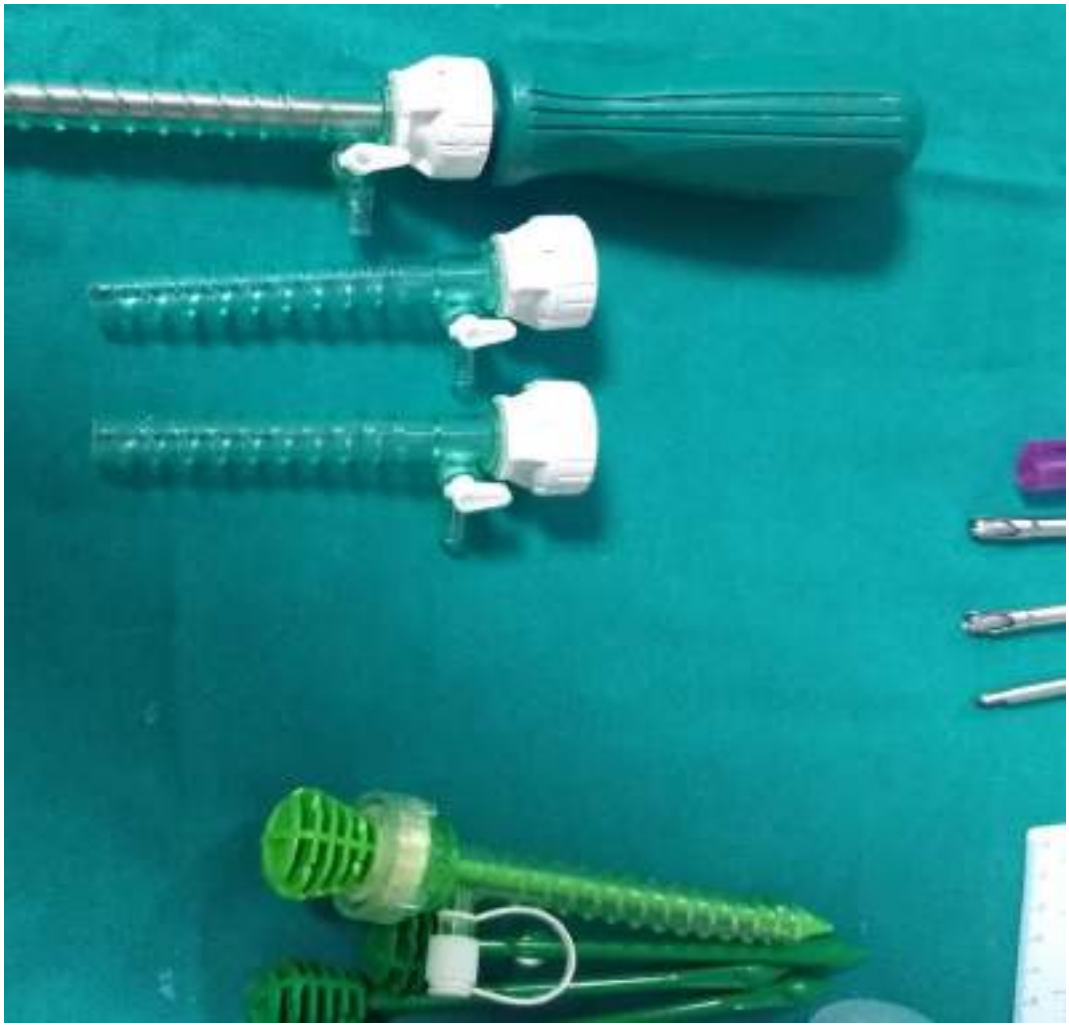
The arm is then held in abduction and forward flexion by an assistant.

PICTURE 11: PATIENT POSITIONING AND DRAPING

PICTURE 12: PATIENT POSITIONING

PICTURE 13: INSTRUMENTS

FROM ABOVE DOWNWARDS GRASPER, PUNCH, PROBE, TROCAR WITH CANULA



PICTURE 14: INSTRUMENTS

FROM ABOVE DOWNWARD TROCAR WITH CANNULA, CANNULA

PICTURE 15: INSTRUMENTS

FROM ABOVE DOWNWARD

KNIFE, FORCEPS SCISSORS, SHAVER, BURR, ARTHOSCOPE (30)^{o}

Arthroscopic evaluation and findings:

The joint inspected for evidence of

- Substantial articular injury
- Concomitant injury to biceps origin,
- Humeral avulsion of the glenohumeral ligament or a rotator cufftear. [33]
- The antero-inferior aspect of the labrum was evaluated.
- Presence of a Bankart lesion noted in all patients.

Presence of Hill Sachs lesion looked for as well the 'Inverted pear shaped glenoid' due to bone loss of the antero-inferior aspect of glenoid.

Arthroscopic procedure proper:

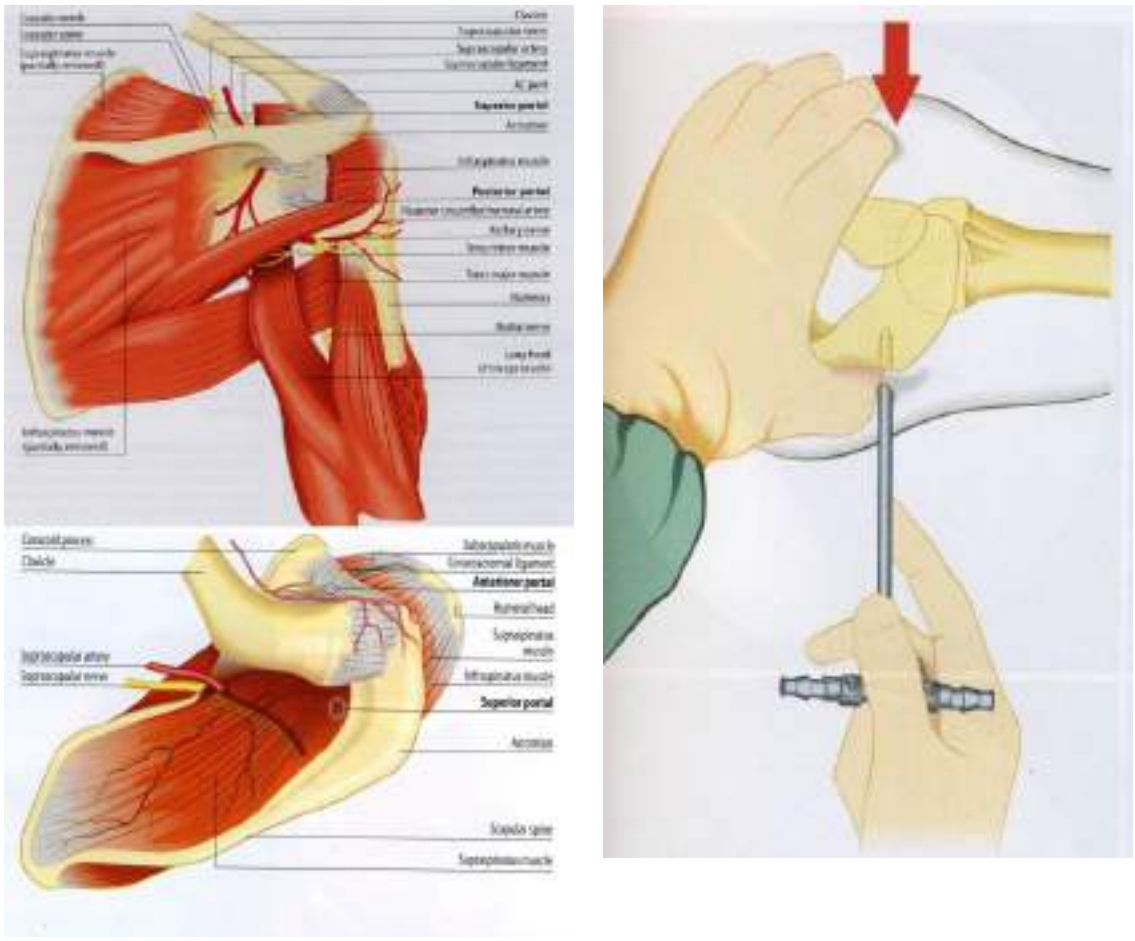
With the patient placed in semi-beach chair position on table, the arm is held in 70º of abduction and 10º of forward flexion by an assistant.

1. Standard posterior mid-glenoid portal (PMGP) and a high anterior–superior portal(ASP) using outside in techniques are made.

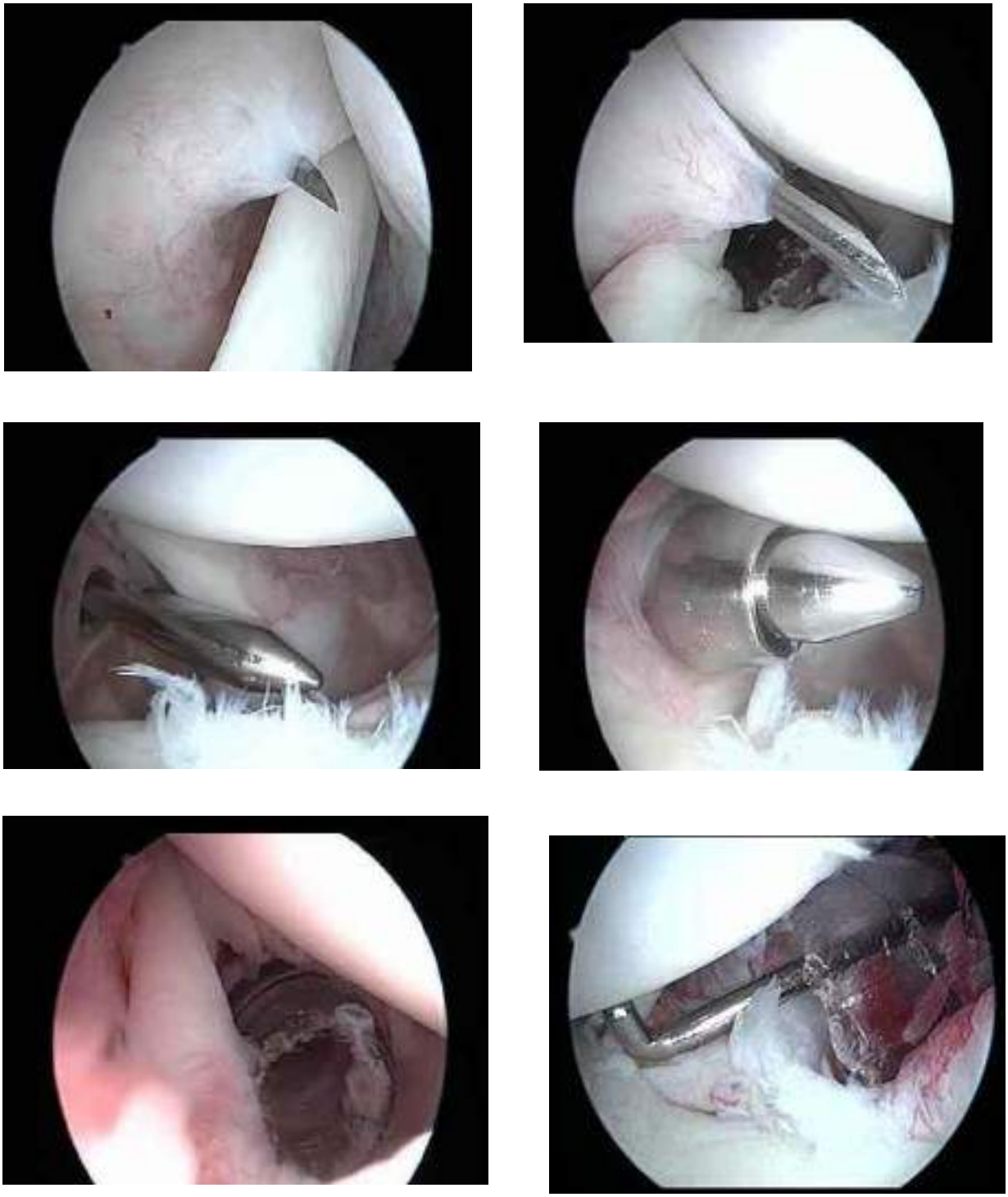
A spinal needle inserted 1 cm anterior to the corner of anterior acromion so as to enable it to enter the joint in the rotator interval just anterior to the biceps tendon.

A small skin incision made to insert a smooth walled crystal canula fitted with tapper-tip obturator.

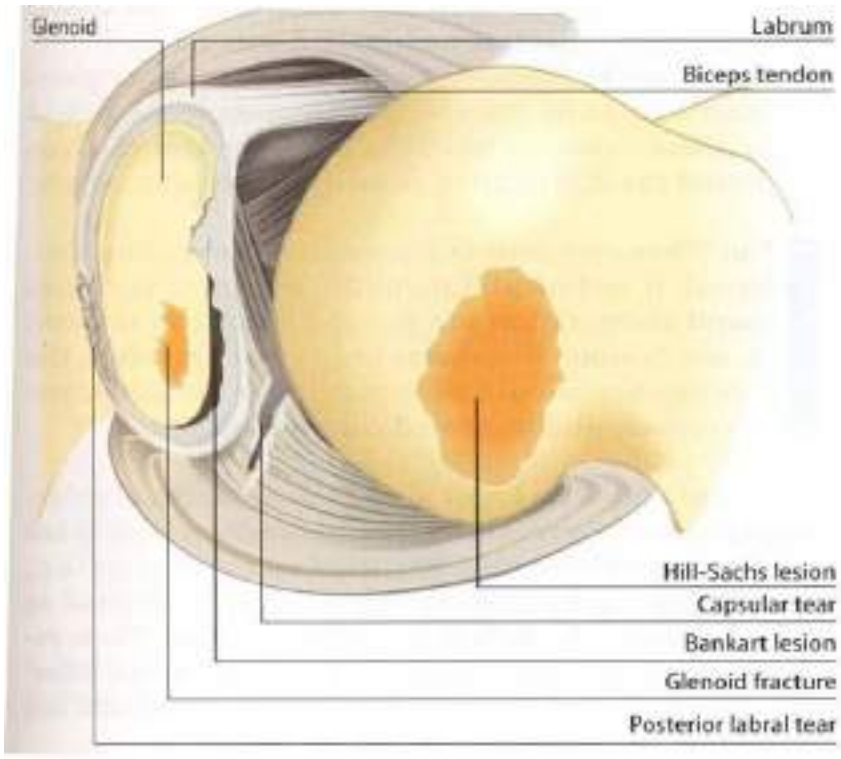
An arthroscopic probe used to palpate the tissues during the complete 15 point anatomy examination.

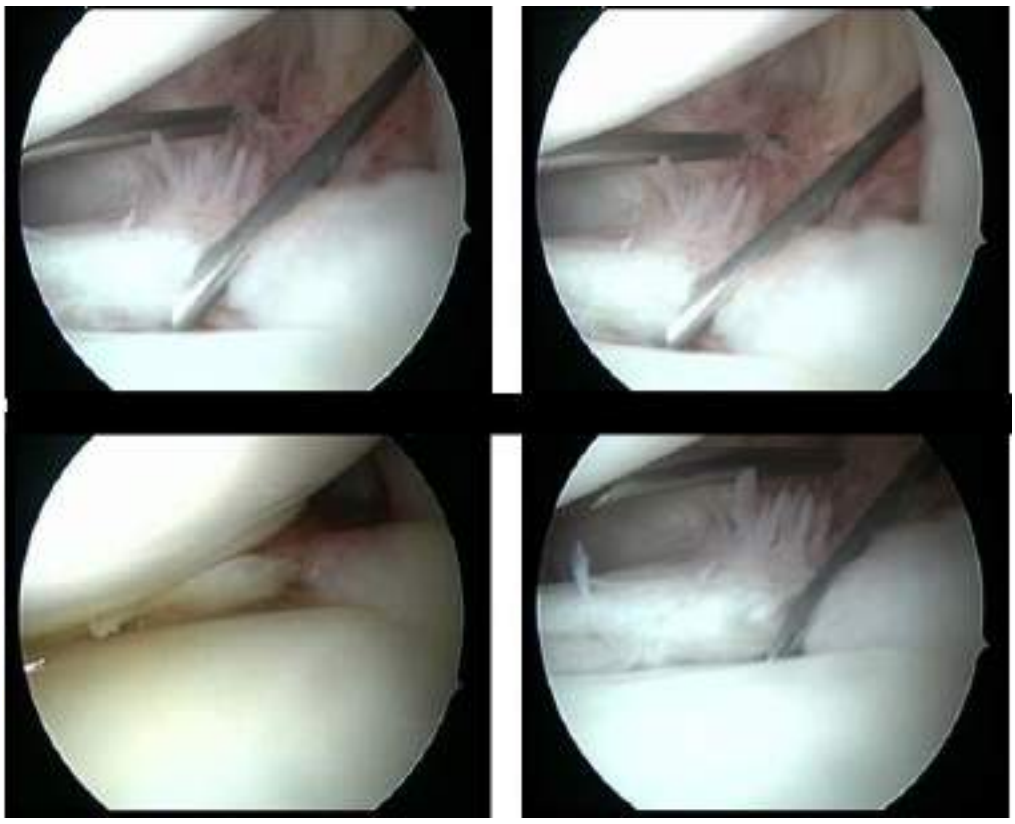


PICTURE 16: DEVELOPING STANDARD POSTERIOR MIDGLENOID PORTAL (PMGP)



PICTURE 17: DEVELOPING ARTHROSCOPIC PORTALS





PICTURE 18: IDENTIFYING BANKART LESION

anterior labrum, posterior and inferior labrum, the ligaments and anterior and posterior capsule attachment to humeral head.

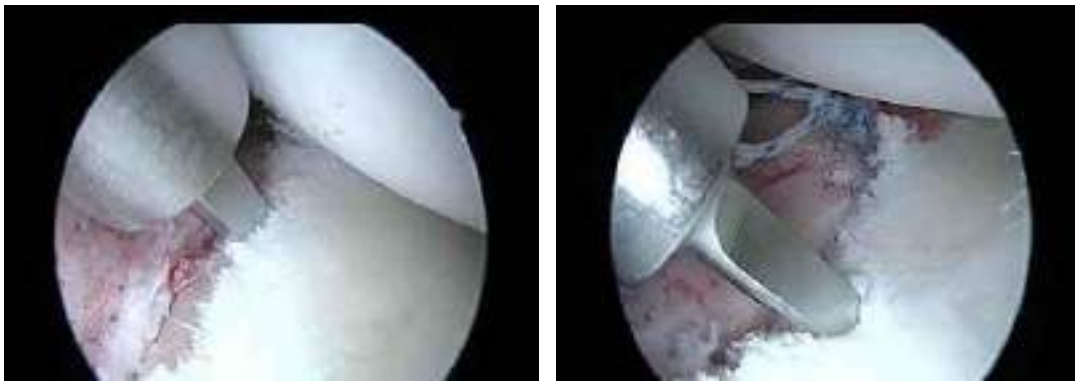
Arm is maintained in 70 degrees of abduction arthroscopy position.

The 6mm smooth crystal cannula into the Anterior mid glenoid portal (AMGP) and the scope into the Anterior Superior Portal(ASP) for the anterior reconstruction. Anterior edge of the glenoid debrided removing frayed tissues.

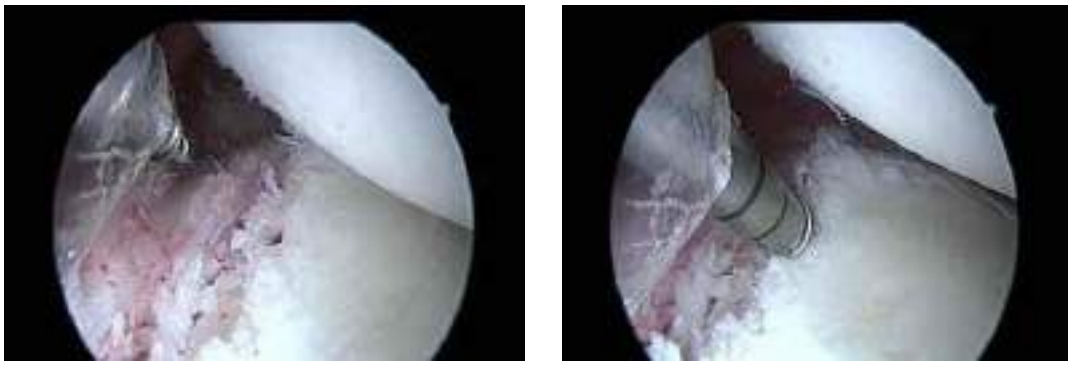
Mobilization of the anterior labrum and capsule done completely from the neck of the glenoid using liberator knife and shaver. The tissues are freed down to 6 o'clock position.

The freedom of the anterior tissue mobility is tested by grasping the labral edge with a pincer tool and advancing it to the edge of articular surface. If the tissues float The following structures should be looked carefully are biceps anchor, freely to the surface, the mobilization is complete, if the tissues are still tight, tissues are worked to lever with a tissue liberator as a lever until they are free to move into position up to the articular cartilage surface.

Pilot holes drilled with self stopper 2mm drill bit



PICTURE 19: PREPARING THE BED FOR INSERTION OF SUTURE ANCHORS AND DRILLING HOLES WITH DRILLBIT AT AROUND 5 O'CLOCK, 4:30 AND OCCASIONALLY AT 3:30 O'CLOCK POSITION DEPENDING ON LABRAL TISSUE



PICTURE 20: SUTURE ANCHOR SEATING IN THE PRE DRILLED HOLES

PICTURE 21: STRANDS OF SUTURE EMERGING ANCHOR THROUGH THE ANCHOR

PICTURE 22: 3.0 MM SUTURE (STRYKER WEDGEANCHOR)

The anterior glenoid neck abraded lightly to remove soft tissues and expose cancellous bone which becomes the bed for the newly attached anterior labral tissue for healing.

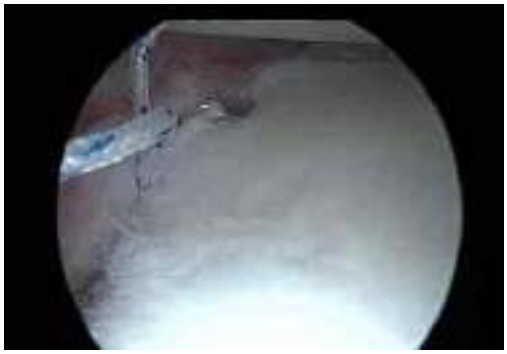
The first pilot hole for the inferior most anchoris created by inserting a 2 mm drill bit with a self-stopper, through the Anterior Mid Glenoid Portal (AMGP), on the face of articular cartilage of the glenoid around the 5-o'clock position, down to the horizontal seating line.

One to two additional holes are drilled along the edge of the cartilage at 4:30 and 3:30 o'clock positions depending on the extent and size of the detached labral tissue.

It is ensured that the suture anchor is completely seated below the subchondral bone without risking breaking it off when inserting it in the hard bone of the glenoid.

The anchor is screwed completely below the bone. This ensures that the anchor is 2mm below the subchondral bone. The vertical orientation line aligned toward the anterior inferior capsule to ensure that the eyelet is directed towards labral tissue. While removing the screw driver care should be taken to not to toggle or change the alignment.

45 degree spectrum suture hook loaded with a shuttle relay taking a plication stitch through the detached labral and capsular tissue



PICTURE 23: KNOT TYING

The two suture strands are tied together with Duncan loop sliding locking knot reinforced with multiple reversing half hitch knots

PICTURE 24: SUTURING TECHNIQUE OF CAPSULOLABRAL TISSUE

A crochet hook inserted through the posterior cannula to retrieve one strand of the suture that exists the eyelet from the anterior inferior side of the anchor.

A 45 degree curved spectrum suture hook loaded with a shuttle relay of 1 cm is inserted into the Anterior mid glenoid portal and a healthy plication stitch created through the anterior-inferior capsule tissue 1 to 2cm below the anchor and 1cm lateral from the labral edge.

The wheel on the crescent hook handle rolled to send the shuttle into the joint. The tip of the shuttle grasped with a miniature grasping clamp, and retrieved through the posterior cannula.

Outside the posterior portal, the suture loaded in the eyelet of the shuttle, and carried back through the joint, under the labrum and through the capsule by pulling back on the anterior end of the shuttle. The suture unloaded from the shuttle and pulled up the slack to make the suture strand that was pulled up with the shuttle short, which will be designated as ‘Post’.

The mobility of the suture tested to make sure the suture moves through the eyelet easily. The two suture strands tied together using a Duncan loop sliding locking knot. The knot reinforced with multiple reversing half hitches to secure the knot.

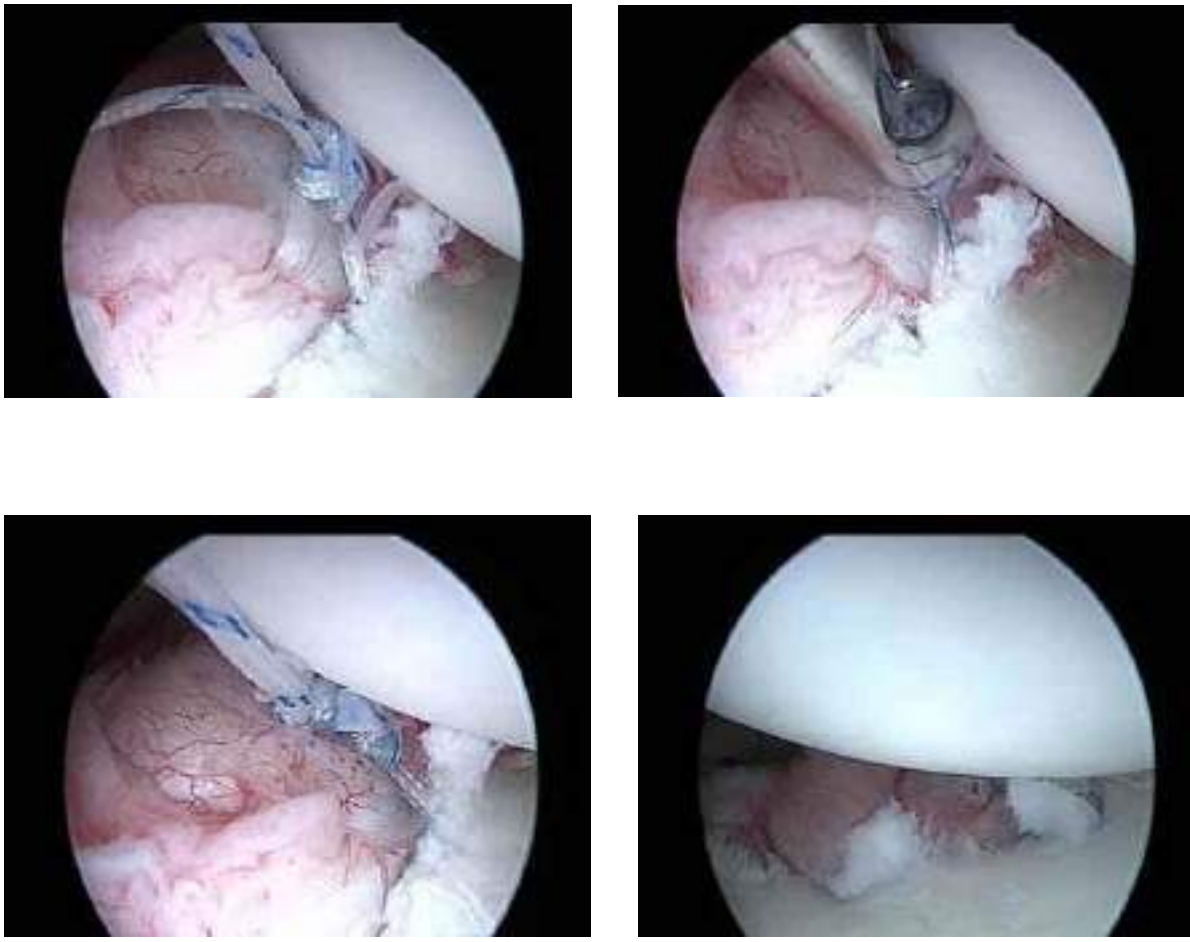
The suture tails are cut with a basket punch of micro scissors leaving a 2mm tail.

The second suture anchor passed in similar fashion and the suture passed through the capsule ‘tuck’ and under the labrum using the shuttle relay. The sutures are tied as before.

The need for third suture anchor around 3:30 o’clock position depends on the size and extent of detached labral tissue and when indicated similar steps are followed as the second suture anchor to complete the repair.

A final evaluation of the joint done from the anterior superior portal and documented which shows the humeral head is balanced in the centre of the glenoid.

The two suture strands are tied together with Duncan loop sliding locking knot and is reinforced with multiple reversing half hitch knots



PICTURE 25: KNOT TYING

PICTURE 26: Post-operative x-ray showing suture anchors

PICTURE 27: Post-operative immobilization of shoulder in a 'shoulder immobilizer'

POST OPERATIVE REGIMEN AND REHABILITATIONPROGRAM

The arm supported in a shoulder immobilizer for a period of 3weeks.

OUTPATIENT POST-OPERATIVE PHYSIOTHERAPY GUIDELINES

Anterior Stabilization Contra-indications

No external rotation unless markedly reduced range (see time guidelines)

- No active or passive Abduction with external rotation for eight weeks.
- No forceful stretching/stressing anterior capsule (eg. arm forced into horizontal extension at end range of conventional press up) for twelve weeks.

Three weeks post-operation

Main emphasis is on regaining flexion range of movement. External rotation is restricted.

a. Wean out of sling
b. Mobility exercises – mainly flexion
c. Progress to active assisted
d. Start isometric cuff work in neutral (pain- free & scapula stable)
e. Avoid passive stretch external rotation beyond20º
f. Avoid combined abduction & external rotation

If appears to be regaining full range of movement very quickly – stop mobility work and concentrate on cuffre habilitation.

Six weeks post-operation

Main emphasis is on increasing muscle activity (cuff and scapula) with optimal movement patterning

a. Range of movement should be approx 75% flexion contra lateral side
b. External rotation should be restricted still (50% contra lateral shoulder)
c. Progress cuff activity
d. Progress scapula muscle activity
e. Do not work or stretch into combined abduction/lateral rotation
f. Proprioceptive muscle work

Twelve weeks post-operation

Main emphasis is on power, endurance & Proprioceptive muscle work aiming towards functional activities

a. Progress resistance through range
b. Stretches if necessary for functional activities, but external rotation range should remain tighter
c. Function specific training
d. General guidelines for rehabilitation

Some variation in ability of patients to regain movement following surgery and immobilization. Adjust therapy input to this.

Some need considerable help with mobilization, others need 'holding back' with more emphasis on muscle activity.

Guidelines for returning to activities

- Driving at four to six weeks
- Swimming – breaststroke at six to eight weeks, freestyle at twelve weeks
- Return to non-contact sport at twelve weeks (if range and control of movement allows)
- No contact sport for six months minimum (this may vary depending on the sport like football, martial arts, racket sports, rock climbing.[34])

OBSERVATION AND RESULTS

The following observations were made from the data collected during study of “Evaluation of outcome of arthroscopic Bankart’s repair in anterior shoulder instability” in the Department of Orthopaedics, DMC&H, Ludhiana. All the patients operated in DMC & H from Jan 2016 to May 2019 were included in the study and were followed up for a period of 6 months.

Age distribution:

Age group	No. of cases	Percentage
< 25	10	62.5%
> 25	6	37.5%
Total	16	100.0%

TABLE1: AGE DISTRIBUTION

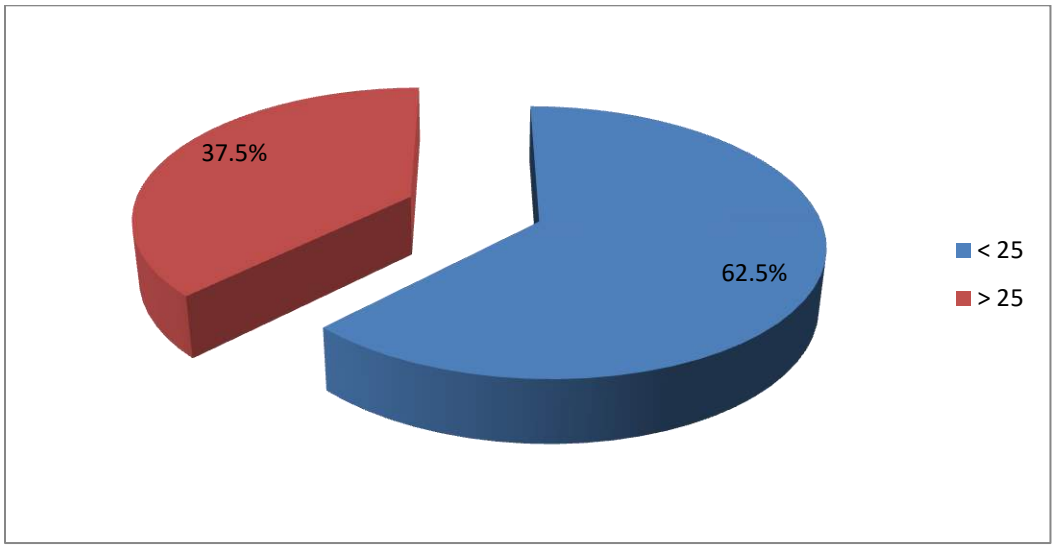


FIG 1: AGE DISTRIBUTION

Majority of the patients were in the age group less than 25 (62.5%).

Mean age was 28.4 with SD 10.3.

37.5 % of patients were in age group of more than 25 years.

DURATION OF INJURY:

Duration of injury	No. of cases	Percentage
< 1 years	3	18.8%
1-5 years	8	50.0%
> 5 years	5	31.3%

TABLE 2: DURATION OF INJURY

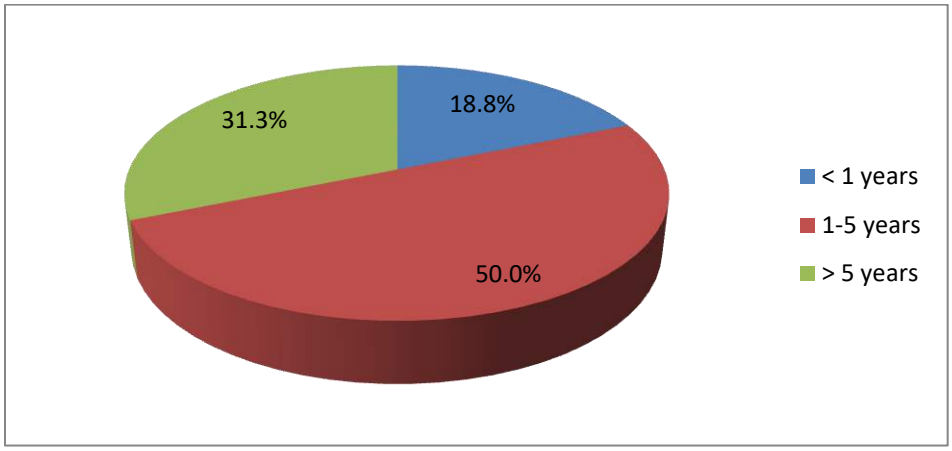


FIG 2: DURATION OF INJURY

Majority of patients had symptoms for a period ranging from 1 to 5 years (50%).in 18.8 % patients the duration of symptoms was less than 1 year.5 patients (31.3%) had symptoms persisting for more than 5 years.

Total score_6 month **Duration Of Injury**	N	Mean	Std. Deviation	F	p-value
< 1 years	3	96.67	5.774	0.132	0.878
1-5 years	8	95.63	5.630		
> 5 years	5	97.00	2.739		
Total	16	96.25	4.655		

TABLE 3: DURATION OF INJURY

On comparing outcomes according to duration of injury, Association of pre-operative Rowe score to post-operative outcome was found to be statistically insignificant (p= 0.878)

SEX DISTRIBUTION:

Sex	No. of cases	Percentage
M	16	100.0%

TABLE 4: SEX DISTRIBUTION

All the patients were males. Hence the incidence of shoulder instability dominated in male population in our study.

OCCUPATION:

Profession	No. of cases	Percentage
Low Physical Demand	11	68.8%
High Physical Demand	5	31.3%
Total	16	100.0%

TABLE 5: OCCUPATION

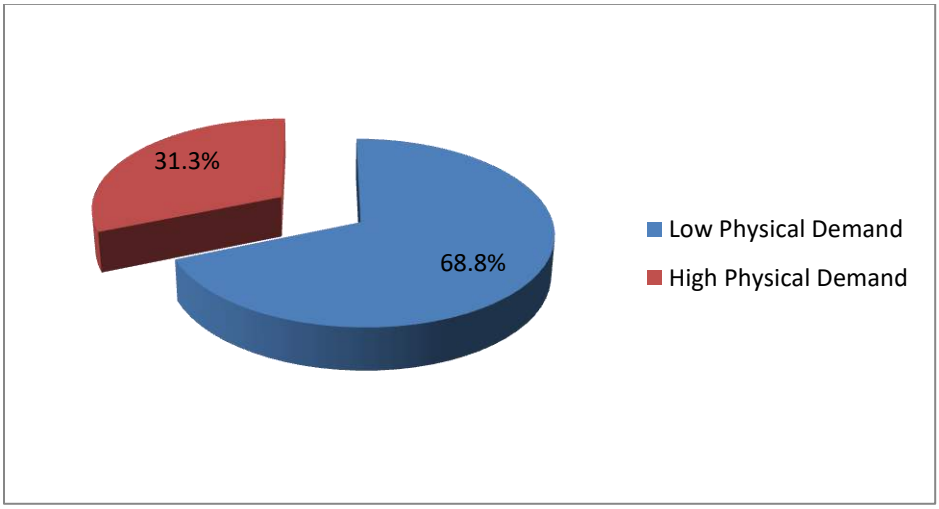


FIG 3: OCCUPATION

Occupation: Five patients (31.3%), were involved in significant occupation requiring overhead activity such as students with sporting activities, agriculturists, athletes, policemen.11 patients (68.8%) were involved in regular life style and didn't have high functional demand.

SIDE INVOLVED :

Side	No. of cases	Percentage
Left	4	25.0%
Right	12	75.0%
Total	16	100.0%

TABLE 6: SIDE INVOLVED

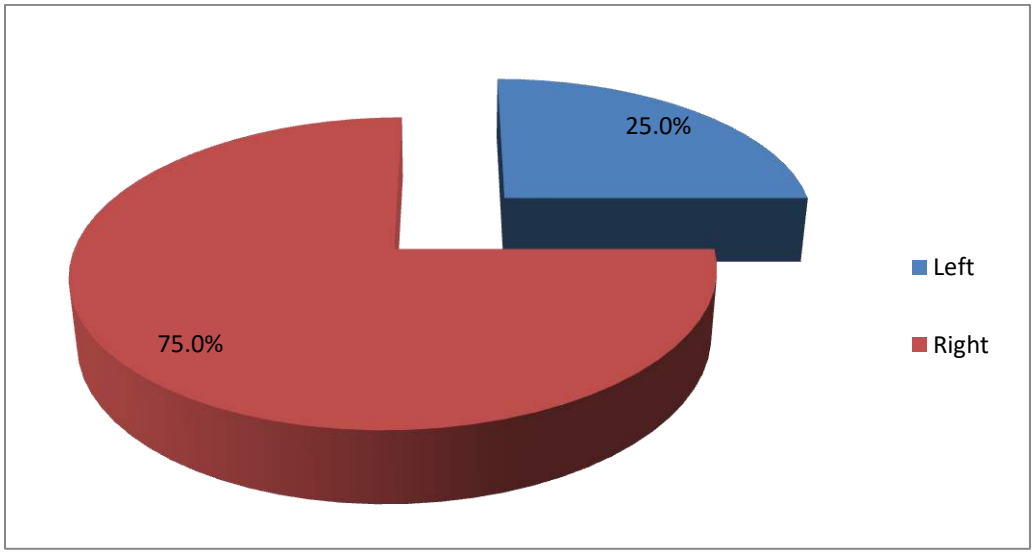


FIG 4: SIDE INVOLVED

Side: Among 16 patients, 12(75%) patients had their Right shoulder involved, rest 4(25%) patients had Left shoulder involved.

MECHANISM OF INJURY:

Mechanism of Injury	No. of cases	Percentage
Fall	8	50.0%
Sport injury	6	37.5%
Slipped and tractional injury	2	12.5%
Total	16	100.0%

TABLE 7: MECHANISM OF INJURY

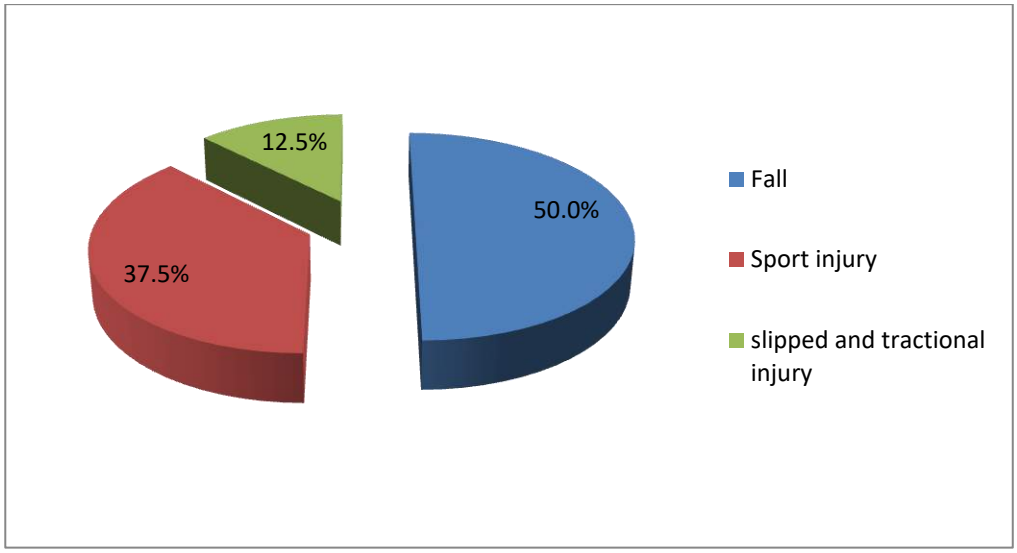


FIG 5: MECHANISM OF INJURY

Among 16 patients, 50 percent suffered injuries during a domestic fall. 37.5 percent of injuries incurred during sporting activities. 12.5 percent patient suffered tractional injuries also mostly due to gripping of support during anticipated or ongoing fall.

Total score_6 month **Mechanism of Injury**	N	Mean	Std. Deviation	F	p-value
Fall	8	95.00	5.345	0.542	0.594
Sport injury	6	97.50	4.183		
Slipped and Tractional injury	2	97.50	3.536		
Total	16	96.25	4.655		

TABLE 8: MECHANISM OF INJURY

For mechanism of injury, the association of pre-operative Rowe score to post-operative outcome at 6 months was found to be statistically insignificant. (p= 0.594)

PRE OPERATIVE DISLOCATIONS:

Recurrent Dislocations	No. of cases	Percentage
Less than 5	6	37.5%
5 to 10	8	50 %
More than 10	2	12.5 %
total	16	

TABLE 9: PRE OPERATIVE DISLOCATIONS

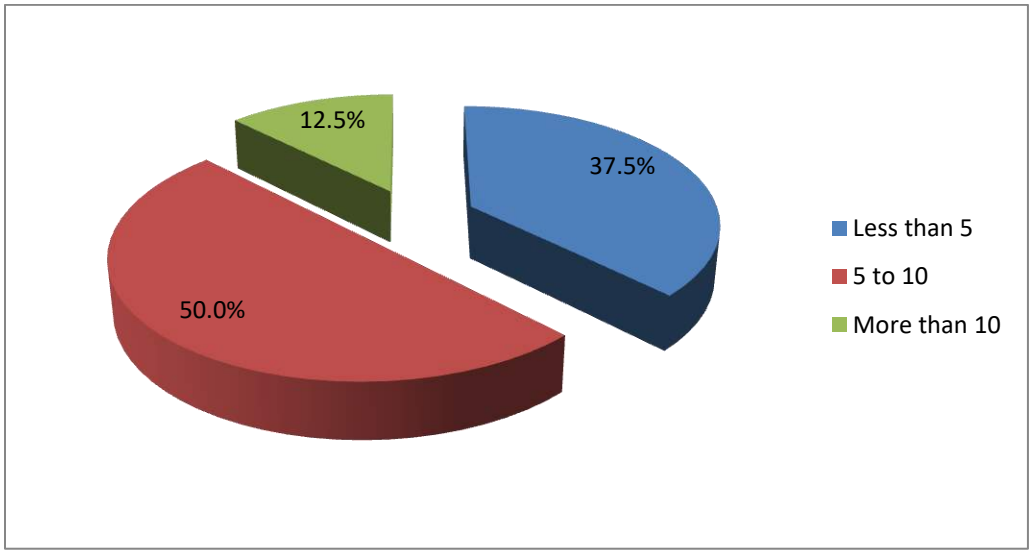


FIG 6: PRE OPERATIVE DISLOCATIONS

Majority of the patients 8 out of 16 (50 %) had 5-10 dislocations prior to surgery. 6 patients (37.5%) reported total number of dislocations to be less than 5 ranging as low as 1. Only 2 patients out of 16 suffered more than 10 dislocations ranging to a maximum of 20.

CLINICAL TESTS:

	No. of cases	Percentage
Apprehension Test	16	100.0%
Fulcrum Test	16	100.0%
Drawer Test	16	100.0%

TABLE 10: CLINICAL TESTS

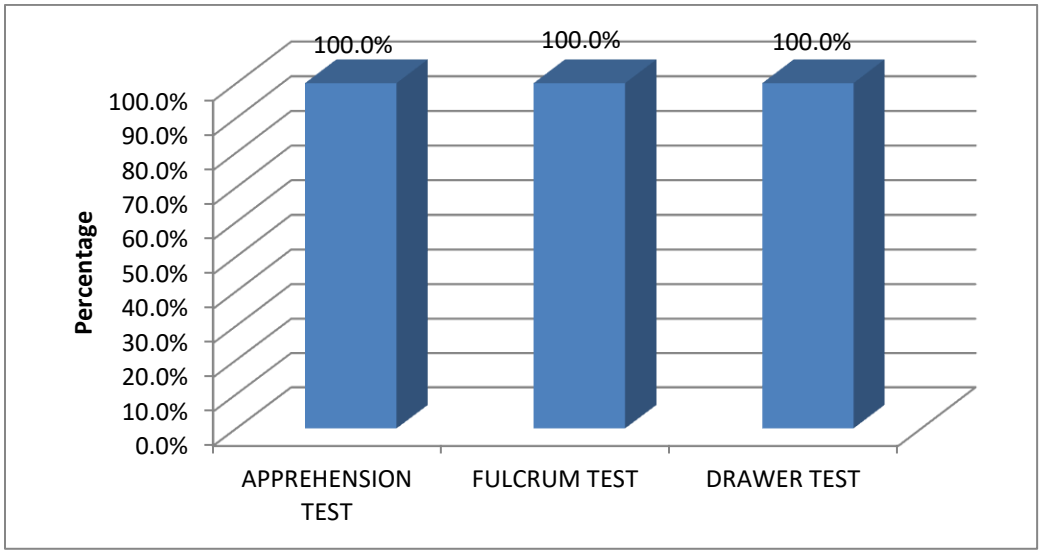


FIG 7: CLINICAL TESTS

All the patients in our study showed positive apprehension test. Other clinical tests were also positive in all the patients examined. Meticulous clinical examination, thus, remains as the mainstay in patient screening.

SUTRURE ANCHORS:

No of suture anchors	No of cases	Percentage
3	9	56.3%
4	7	43.8%

TABLE 11: NUMBER OF SUTURE ANCHORS

The number of suture anchors used in our study for each surgery ranged from 3-4. In majority of cases, 9 out of 16, 3 anchors were used. In 7 patients (43.8 %), 4 anchor sutures were used.

POST OPERATIVE COMPLICATIONS:

	No. of cases	Percentage
NERVE INJURY	0	0.0%
INFECTION	0	0.0%
LOOSENING IMPLANT	0	0.0%
MIGRATION OF IMPLANT	0	0.0%
BREAKAGE OF IMPLANT	0	0.0%
RECURRENT INSTABILITY	0	0.0%
STIFFNESS	0	0.0%
INFLAMMATORY REACTION	0	0.0%
OSTEOARTHRITIS	0	0.0%

TABLE 12: POST OPERATIVE COMPLICATIONS

Out of 16 patients, no patient presented with the above complications.

This can be attributed to limited sample size, shorter duration of follow up and also to the surgical technique as all the surgeries were carried out at the same hospital by a single surgeon at different period of time.

PHYSIOTHERAPY:

Physiotherapy Taken (Y/N)	No. of cases	Percentage
NO	1	6.3%
Y	15	93.8%
Total	16	100.0%

TABLE 13: PHYSIOTHERAPY

Out of 16 patients, 93.8 percent had regular physiotherapy. However, final results showed no significant difference which is due to the fact that all patients except one followed a rehabilitation programme as advised by the treating doctor.

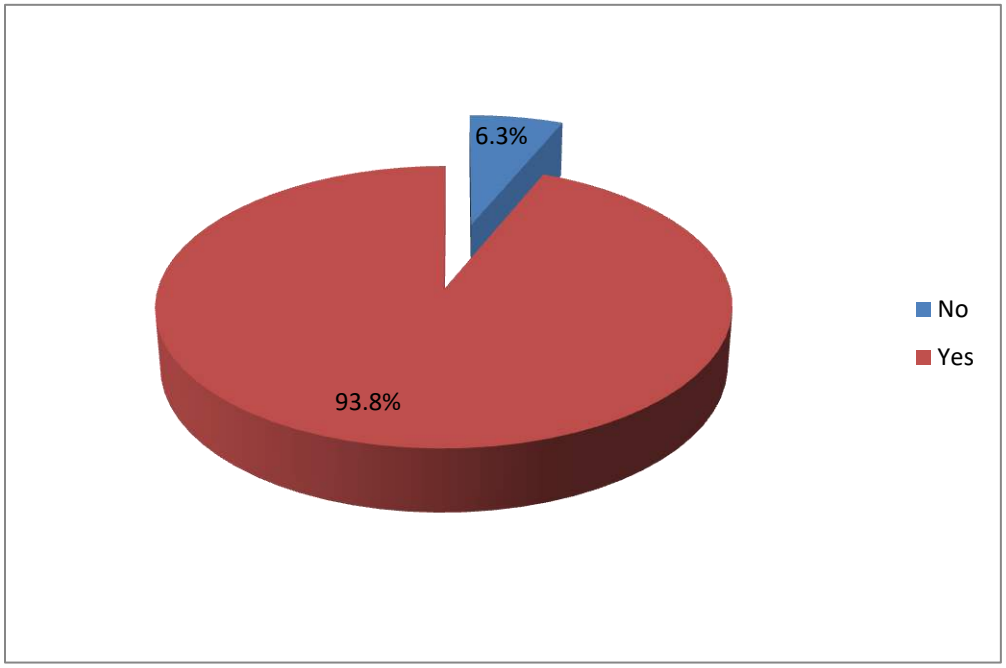


FIG 8: PHYSIOTHERAPY

ROWE SCORE:

	N	Min	Max	Mean	Std. Deviation	t	p-value	Mean	Std. Deviation
Total score pre op	16	15.0	60.0	45.6	11.8				
Total score post op	16	25.0	75.0	51.3	13.7	-1.781	0.095	-5.63	12.63
Total score 1 month	16	60.0	100.0	77.8	9.1	-10.290	0.000	-32.19	12.51
Total score 6 month	16	85.0	100.0	96.3	4.7	-16.939	0.000	-50.63	11.95

TABLE 14: ROWE SCORE

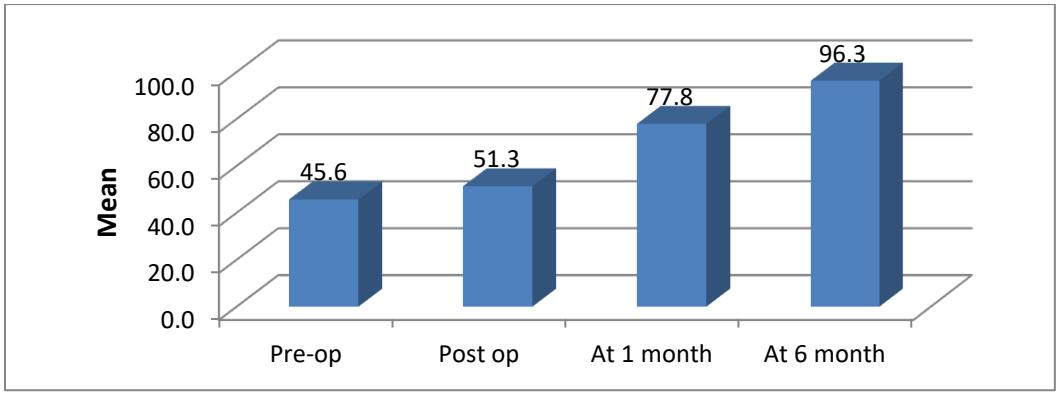


FIG 9: ROWE SCORE

Pre-operative mean Rowe score of 45.6, improved on periodic rehabilitation of 3rd, 6th, 12weeks and 6 months, to a mean Rowe score of 77.8 at the end of 1 month and 96.3 by the end of 6 months. Association of Rowe score to post-operative outcome was found to be statistically significant (p 0.000).

FUNCTIONAL COMPONENT OF ROWE SCORE :

	N	Min	Max	Mean	Std. Deviation	t	p-value	Mean	Std. Deviation
Function pre op	16	0.0	35.0	25.3	10.1				
Function post op	16	0.0	35.0	22.2	11.1	1.346	0.198	3.13	9.29
Function 1 month	16	35.0	50.0	38.8	6.7	-5.400	0.000	-13.44	9.95
Function 6 month	16	50.0	50.0	50.0	0.0	-9.799	0.000	-24.69	10.08

TABLE 15: FUNCTIONAL COMPONENT OF ROWE SCORE

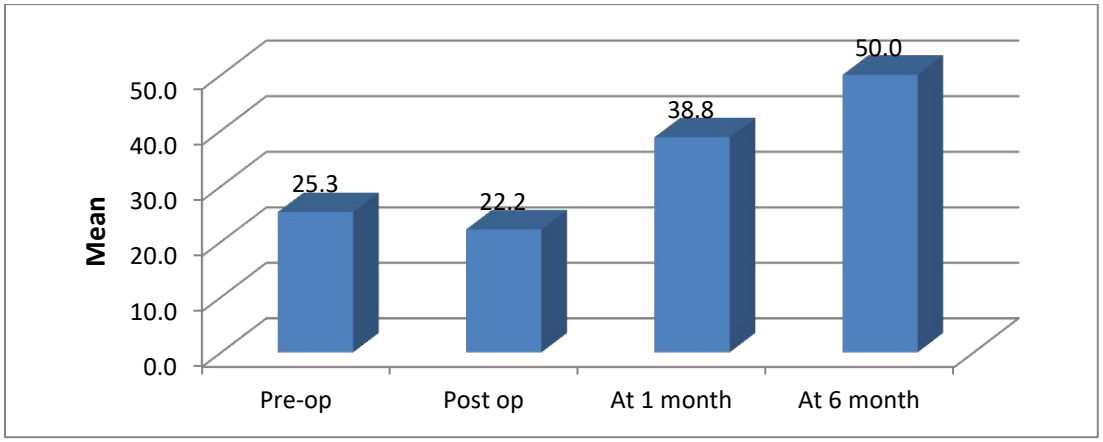


FIG 10: FUNCTIONAL COMPONENT OF ROWE SCORE

Pre-operative function component of Rowe score of 25.3 (mean function score), improved on periodic rehabilitation of 3rd, 6th, 12weeks, 6 months, to a function component of Rowe score of 38.8 by one month and 50 (mean function score) by the end of 6 months. Association of functional component of Rowe score to post-operative outcome was found to be statistically significant (p 0.000).

PAIN COMPONENT:

	N	Min	Max	Mean	Std. Deviation	t	p-value	Mean	Std. Deviation
Pain_preop	16	0.0	5.0	2.5	2.6				
Pain_postop	16	0.0	5.0	4.7	1.3	-3.416	0.004	-2.19	2.56
Pain_1 month	16	5.0	10.0	6.3	2.2	-3.873	0.002	-3.75	3.87
Pain_6 month	16	0.0	10.0	8.1	3.1	-5.582	0.000	-5.63	4.03

TABLE 16: PAIN COMPONENT

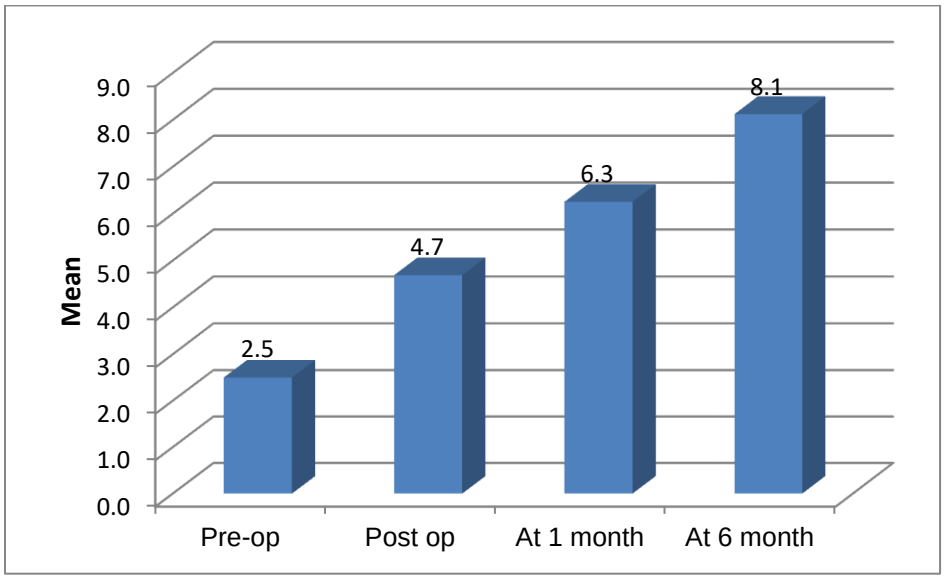


FIG 11: PAIN COMPONENT

Pre-operative pain component of Rowe score of 2.5 (mean function score), improved on periodic rehabilitation of 3rd, 6th, 12weeks, 6 months, to a function component of Rowe score of 6.3 after 1 month and 8.1 (mean function score) by the end of 6 months. Association of pain component of Rowe score to post-operative outcome was found to be statistically significant (p 0.000)

STABILITY COMPONENT:

	N	Min	Max	Mean	Std. Deviation	t	p-value	Mean	Std. Deviation
Stability pre op	16	15.0	15.0	15.0	0.0				
Stability post op	16	15.0	30.0	20.6	7.5	-3.000	0.009	-5.63	7.50
Stability 1 month	16	15.0	30.0	27.2	6.0	-8.062	0.000	-12.19	6.05
Stability 6 month	16	15.0	30.0	29.1	3.8	-15.000	0.000	-14.06	3.75

TABLE 17: STABILITY COMPONENT

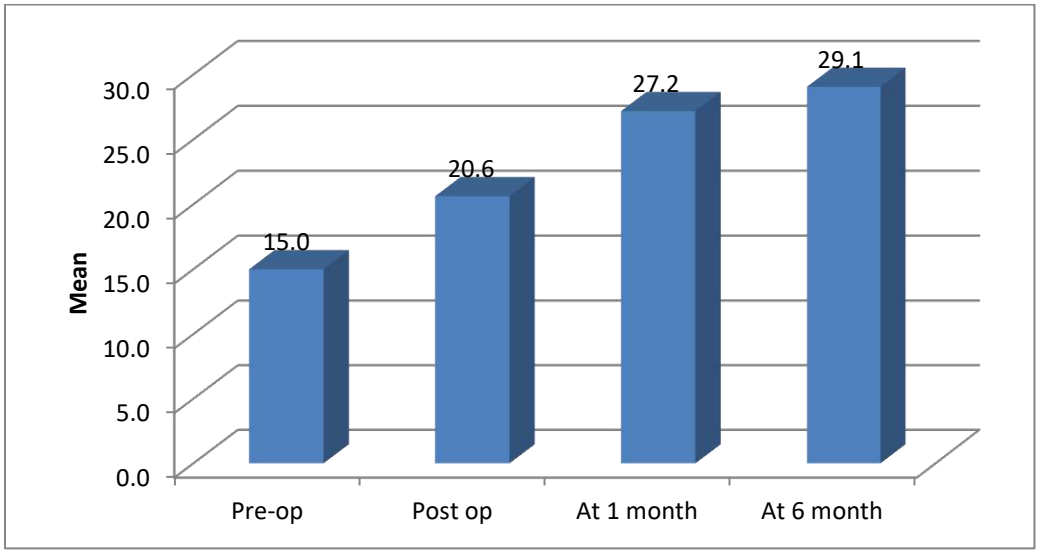


FIG 12: STABILITY COMPONENT

Pre-operative stability component of Rowe score of 15 (mean function score), improved on periodic rehabilitation of 3rd, 6th, 12weeks, 6 months, to a function component of Rowe score of 29.1 (mean function score) by the end of 6 months. Association of stability component of Rowe score to post-operative outcome was found to be statistically significant (p 0.000)

RANGE OF MOTION COMPONENT:

	N	Min	Max	Mean	Std. Deviation	t	p-value	Mean	Std. Deviation
Motion pre op	16	0.0	5.0	2.8	2.6				
Motion post op	16	0.0	5.0	3.8	2.2	-1.145	0.270	-0.94	3.28
Motion 1 month	16	0.0	10.0	5.6	2.5	-3.576	0.003	-2.81	3.15
Motion 6 month	16	5.0	10.0	9.1	2.0	-11.180	0.000	-6.25	2.24

TABLE 18: RANGE OF MOTION COMPONENT

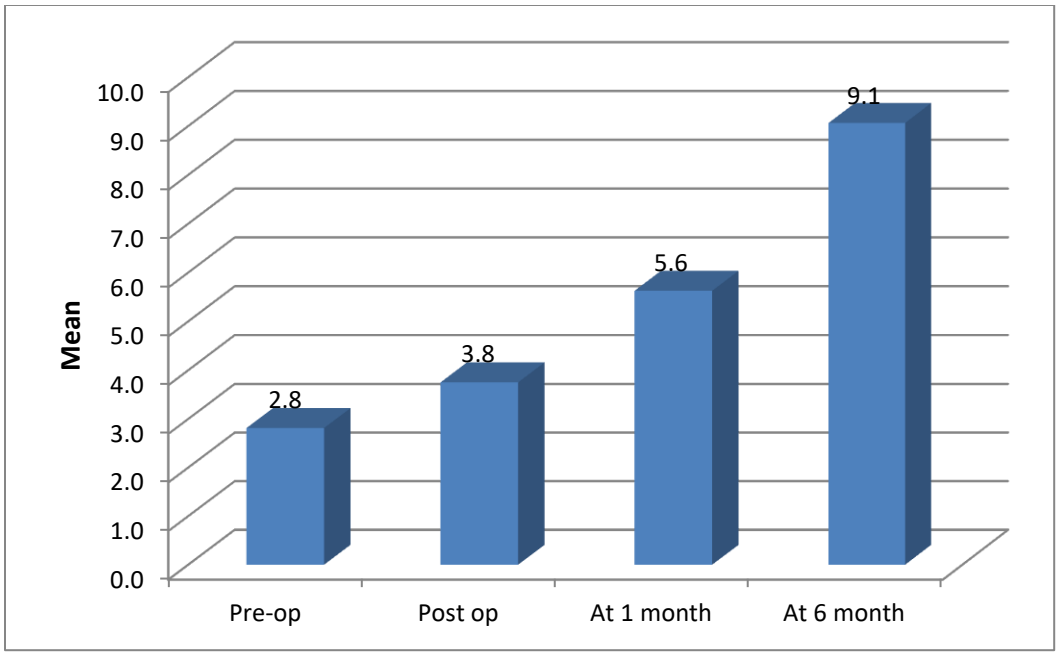


FIG 13: RANGE OF MOTION COMPONENT

Pre-operative range of motion component of Rowe score of 2.8 (mean function score), improved on periodic rehabilitation of 3rd, 6th, 12weeks, 6 months, to a function component of Rowe score of 9.1 (mean function score) by the end of 6 months. Association of range of motion component of Rowe score to post-operative outcome was found to be statistically significant (p 0.000)

DISCUSSION

The present study enrolled a total of 16 patients with anterior shoulder instability. All patients were followed up for a period of 6 months post operatively. Complete data of sixteen patients was available for compilation of results and analysis. All patients underwent arthroscopic bankart's repair done by single surgeon.

Majority of patients were in the age less than 25 years, with mean age of 28.4(±10.3). In a study of 21 patients who underwent arthroscopic Bankart repair with suture anchors for anterior shoulder instability by Katti et al the mean age at surgery was 27.19(range 17-44) years.[35]We observed in our series that majority of patients were in the second and third decade of life with higher incidence in males and is in correlation with most of other studies. All the patients were males in our study. This could be due to more outdoor activities in this age group or more indulgence in sports, making them more prone to injuries. The usual events leading to this type of injury are car accidents, sports collision injuries, fall from sports, domestic fall, overuse injuries. Clearly more indulgence of male population in such activities attributes to our findings. Young and productive population is involved in shoulder injuries, affecting both physical and mental health and quality of life. Mohapatra and kumar conducted a study of arthroscopic Bankart repair in recurrent anterior shoulder dislocation with suture anchors in 20 patients in which 90 percent of the patients were males which is similar to our study.[36]n our series, the number of female patients (n = 0) made it impossible to perform any valid analysis on whether sex is a significant factor influencing the outcome.

Eleven patients (68.8%), were involved in significant occupation requiring overhead activity such as farmer, students with sporting activities, policemen, army person, athletes. Katti et al conducted a study on 21 patients with mean age of years (range yrs.) who underwent arthroscopic Bankart repair with suture anchors for anterior shoulder instability. Most of the patient 66.7% were in recreational sports, 14.3% were doing daily activities of life and only

19% were involved in competitive sports[35].In our study also 68.8 % patients were involved in occupation with high demands or played sports recreationally.6.3% patients were involved in competitive sports.

Majority of patients had symptoms for a period ranging from 1 to 5 years (50%). The duration of symptoms was less than 1 year in 3 patients (18.8%) and Above 5 years in 5 patients (31.3%).There was no statistical association between re-dislocation and duration of symptoms as shown by similar study conducted by Filho et al.[37]

Among 16 patients, 12(75%) patients had their Right shoulder involved, rest 4(25%) patients had Left shoulder involved. Mohapatra and kumar in their study of arthroscopic Bankart repair in recurrent anterior shoulder dislocation with suture anchors in 20 patients showed that among 20 patients, 12 (60%) patient had their right side involved, rest 8 (40%) patients had left shoulder involved.[36]This is similar to our study.

Regarding Pre-operative pain and discomfort, Among 16 patients, 7 (43.75%) patients had mild limitation and minimum discomfort, 8(50%) patients had moderate limitation and discomfort and one patient (6.25%) had marked limitation and discomfort. Among 16 patients, 6 patients (37.5%) had less than 5 dislocations preoperatively, 8(50%) patients had 5-10 dislocations pre operatively and 2(12.5%) patients had more than 10 dislocations preoperatively. Mean recurrent dislocations preoperatively were 5.7 with SD 4.5 and range was 1-20.In a study by Adla et al[38],the average age of patients at surgery was 24 (18–28) and average numbers of dislocations per patient was three. In a study by Daniel et al.[39] recurrent episodes of dislocation were following a traumatic anterior dislocation of shoulder with an average of 4.8 episodes (range 2 to30). More number of recurrent dislocations pre operatively, as found in our study are due to late presentation due to many reasons like lack of awareness about the problem and its surgical correction, apprehension about the disability and the procedure too, financial issues, difficulty of accessing tertiary health care centre or ignorance.

All patients had apprehension test positive response, Jobe et al[24]described as pain as the only positive finding in apprehension testing. Positive apprehension test is a very helpful in clinically diagnosing shoulder instability. Pain is suggestive of anterior sub-luxation, even in the absence of apprehension. In our study, we found that clinical examination played a key role in screening as well as diagnosing anterior shoulder instability. All the patients In our study had apprehension test positive which co-related with the MRI findings that were positive in all patients. So the surgeon may not depend on radiological investigation only as it lowers the financial burden on healthcare system and the patient too.

In 9 (56.3%) patients 3 anchor sutures were used, in 7 (43.8%) patients 4 anchor sutures were used. However, none of the patient had recurrent dislocation. The two suture strands tied together using a Duncun Loop sliding locking knot and the knot reinforced with 4-5 reversing half hitch knots. Pascal Boileauet al[40] concluded by suggesting at least four anchor points should be used to obtain secure shoulder stabilization. Filho et al conducted a retrospective study on 49 patients who underwent arthroscopic repair of anterior shoulder instability between 2002 and 2007.the mean number of anchors was 3.0 (range from 1 to 5)(37). In our study, no patient complained of pain or sense of instability or discomfort. Daniel et al[39] in their study of the forty patients in the study, none complained of any pain or subjective sense of instability post-operatively. In Seedek et al.[41] series, it was reported that stability had been achieved with the use of fewer than three suture anchors. Patients who had only two suture anchors did not have a higher rate of recurrence. In a study by Watch et al.,[42] they suggested that the use of fewer than four suture hooks could have been one of the reasons for failure. A systemic review showed that patients operated using two anchors had a higher incidence of recurrence instability (35%) compared to patients operated using three or more anchors (20%).[43] We found that correct placement of anchor sutures , abrading the glenoid neck , mobilization and

freshening of capsule and plication of capsule done very carefully yielded promising results.

On analyzing the final outcome, Mean Rowe score was 48.25, with mean scores of stability21±14.10, mean score of function11.25±9.15, mean score of motion16±2.05.The mean post-operative Rowe score improved to 96.3 from a pre-operative Rowe score of 45.6with excellent in 15 patients, good in 1patient.Post operatively the mean Rowe score was 51.3.Post operatively at 1 month follow up the mean Rowe score was 77.8. At 6 months follow up the mean Rowe score 96.3.Katti et al conducted a study on 21 patients with mean age of years (range yrs) who underwent arthroscopic Bankart repair with suture anchors for anterior shoulder instability .In their study UCLA score at 1 year of follow-up showed excellent to good results in 85.7% patients and 9.5% fair results. 4.7% patient had poor functional outcome. 4.7% had recurrence rate and persistent instability.[(35)]No doubt, that re-dislocation rate in anterior shoulder stabilization done arthroscopically or with open technique has been reported fairly low. Lenterset al[32] demonstrated that arthroscopic treatment led to a better functional result according to Rowe score. These studies are consistent with our study in which 93.8 % patient had excellent result and there were 0 % patients with re-dislocation. Absence of any re-dislocation in our study may be probably due to a follow up period of 6 months. But all surgeries in our study, were done over span of more than 3 years by single surgeon. The outcome may vary due to technical expertise.

Various studies such as Cole BJ et al. [44], Mishra DK et al. [45] and IDE J et al. [46] have shown similar good to excellent functional results following arthroscopic Bankart repair. Loss of range of motions remained a matter of concern till the time shoulder instability was addressed with open procedures. The advent of arthroscopic technique favored minimal compromise of range of motion post operatively which restored to pre injury levels post rehabilitation. Post operatively only 3 out of 16 patients had loss of motion and that too was no more than 25 percent in any plane. 13 patients had full range of motion post operatively. Similarly, Mishra et al in their study of 42

patients with mean follow up of 28 months concluded that No patients had any motion loss greater than 10 degrees [47]. This shows that loss of range of motion, if present, is terminal only. Nevertheless this is somewhere aim of the surgery to reduce the recurrence of dislocation. None of the 16 patients postoperatively experienced apprehension. There was no recurrence of dislocation or subluxation reported among 16 patients, during their periodical follow up to 6 months. Bottoni and associates studied 61 consecutive patients (29 open, 32 arthroscopic) for a minimum of 2 years with isolated anterior instability. They found no difference in the SANE, SST, Rowe, or WOSI scores in the two groups. There were no recurrent dislocations in either group.[48]Gartsman et al. [49] had a failure rate of 7.5%, Mishra et al. [45] had 7% and Amit [50] et al. had 7% of failure rate. Tjoumakaris et al compared arthroscopic Bankart repair with open Bankart repair retrospectively in 93 patients available for follow up out of 106 patients, with 69 arthroscopic Bankart repair and 24 open repair, following it up for a period of 24-77 months, concluded with 1 patient from each group reporting with recurrence.[8]In this study we had 0% of failure rate which is close to other studies. No doubt further low failure rate in our study can be attributed to technical expertise, surgical skills, patient selection and rehabilitation.

Limitation of this study is short term follow-up and small study group. The fact that Presence of concomitant pathologies along with bankart lesion may affect the functional outcome in shoulder instability repair, needs to be explored. In conclusion, arthroscopic bankart repair gives good to excellent functional and clinical outcome in anterior shoulder instability.

SUMMARY

This is a study of evaluation of outcome of arthroscopic bankart's repair in anterior shoulder dislocation.

- Most patients are in the age group between 25-35years
- 100% of the patient were males
- 31.3% of the patients were involved in significant occupation
- 12(75%) patients had their Right shoulder involved
- 10(62.5%)patients had five or more than 5 recurrent dislocation episodes preoperatively
- 16(100%)patients had apprehension test positive preoperatively
- Mean pre-operative Rowe score was45.6
- In majority of cases, 9 out of 16, 3 anchors were used. In 7 patients (43.8%) , 4 anchor sutures were used

Post-operative follow up:

- Mean follow up period 6 months
- None of the 16 patients had episode of recurrent dislocation
- None of the 16 patient had anterior translation or apprehension
- The mean post-operative Rowe score improved to96.3
- After 6 months, 15 patients had excellent results.

Conclusion

Arthroscopic Bankart repair is currently the preferred method for surgical management of anterior shoulder instability in a majority of patients. It is the procedure of choice due to its relative lack of invasiveness and low overall complication rate. Arthroscopic Bankart repair is an ideal method of stabilization in patients with an injury to the inferior labrum without significant osseous injury (large bony Bankart or HS lesion). Overall, when performed for the correct indications, arthroscopic repair results in a very low risk for recurrent instability and a good return to sport or work. Future work must focus on long-term outcomes. Additionally, further work is needed to investigate the clinical outcomes in patients with larger bony defects and those undergoing concomitant stabilization procedures such as arthroscopic remplissage.

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Sr No	Name	MRD No	Age	Age group	Sex	Adm No	Date of Adm	Date of Injury	Duration of injury	Duration of injury group	side	MECHANISM OF INJURY	DATE OF FIRST DISLOCATION	RECURRENT DISLOCATIONS	DATE OF FIRST CONSULTATION	DATE OF SURGERY	PROFESSION	NO. OF SUTURES USED	CLINICAL EXAMINATION	APPREHENSION TEST	FULCRUM TEST	DRAWER TEST
1	RS	736486	47	2	m	2019035782	5/29/2019	2000	19	3	right	slipped and held something and suffered tractional injury	2000	20	2019	30-May-19	BUISENESS	3		+	+	+
2	RD	398079	22	1	m	2019010750	2/15/2019	Jul-15	4	2	left	SWIMMING	Jul-15	3	Feb-19	2/16/2019	STUDENT	4		+	+	+
3	RB	123650	27	2	m	201632366	7/5/2016	2012	4	2	right	fall	2012	5	2016	7/7/2016	labourer	3		+	+	+
4	SS	607745	55	2	m	2018069990	10/24/2018	2016	2	2	right	fall	2016	8	Oct-18	10/25/2018	farmer	3		+	+	+
5	TS	144772	25	1	m	2016545416	9/7/2016	2014	2	2	left	slipped and tractional injury	2016	1	9/7/2016	9/8/2016	BUISENESS	4		+	+	+
6	BS	485949	25	1	m	2018025374	4/25/2018	2012	6	3	right	SLIPPED WHILE PLAYING .	2012	6	2018	4/26/2018	STUDENT	4		+	+	+
7	PS	273484	19	1	m	2017029903	6/6/2017	2016	1	2	right	PULLED WHILE PLAIYNG KABADDI	2016	7	2017	6/8/2017	KABADDI PLAYER	3		+	+	+
8	R	333078	19	1	m	2017046987	8/21/2017	Aug-17	0	1	right	SLIPPED WHILE PLAYING FOOTBALL	2017	5	2017	8/22/2017	POLICEMEN	3		+	+	+
9	JK	197815	27	2	m	2017006342	2/9/2017	6/18/2015	2	2	right	FALL WHILE RUNNING	2015	2	2017	2/10/2017	BUISENESS	4		+	+	+
10	SK	274545	42	2	m	2017027693	5/28/2017	5/21/2017	0	1	left	FALL DUE TO SEIZURE	2017		2017	6/1/2017	BUISENESS	3		+	+	+
11	NS	288304	25	1	m	2017032408	6/19/2017	2016	1	2	right	domestic fall	2016	2	2017	6/20/2017	driver	4		+	+	+
12	MS	453331	25	1	m	2018014391	3/7/2018	Mar-17	1	2	right	SEIZURE AND FALL	Mar-17	3	2018	3/8/2018	BUISENESS	4		+	+	+
13	D	482768	21	1	m	2018025013	4/24/2018	2013	5	2	left	SWIMMING	2013	7	2018	4/24/2018	STUDENT	3		+	+	+
14	HK	326733	24	1	m	2017044786	8/12/2017	Jun-17	0.333333	1	right	SWIMMING	Jun-17	3	2017	8/12/2017	ELECTRICITY SUPERVISOR	3		+	+	+
15	G	321419	27	2	m	2017042910	8/4/2017	2011	6	3	right	PLAYING KABADDI	2011	7	2017	7/5/2017	BANK JOB	3		+	+	+
16	AS	708226	24	1	m	2019025490	4/17/2019	2012	7	3	right	PLAYING KABADDI	2012	6	2012	4/18/2019	STUDENT	4		+	+	+

Sr No	Name	MRD No	RADIOLOGICAL EXAMINATION	XRAY FINDINGS	MRI FINDINGS	INTRA OPERATIVE FINDINGS	PHYSIOTHERAPY TAKEN (Y/N)	DURATION	NERVE INJURY	INFECTION	LOOSENING IMPLANT	MIGRATION OF IMPLANT	BREAKAGE OF IMPLANT	RECURRENT INSTABILITY	STIFFNESS	INFLAMMATORY REACTION	OSTEOARTHRITIS	Function pre op
1	RS	736486			ANTERO INFERIOR LABRAL TEAR		Y	3	-	-	-	-	-	-	-	-	-	0
2	RD	398079			bankart lesion extending to nvolve superior labrum, hill sachs lesion		Y	6	-	-	-	-	-	-	-	-	-	20
3	RB	123650		hill sachs lesion	-	ANTEROINFERIOR LABRAL TEAR	Y	1	-	-	-	-	-	-	-	-	-	20
4	SS	607745		HUMERAL HEAD DEFECT	BANKART LESION , HILL SACHS LESION .		Y	6	-	-	-	-	-	-	-	-	-	20
5	TS	144772			antero-inferior labral tear , rotator cuff partial tear		Y	1	-	-	-	-	-	-	-	-	-	35
6	BS	485949		NAD	BANKART LESION	ANTEROINFERIOR LABRAL TEAR	Y	6	-	-	-	-	-	-	-	-	-	35
7	PS	273484		NAD	BANKART LESION		NO		-	-	-	-	-	-	-	-	-	35
8	R	333078			BANKART LESION AND HILL SACHS DEFORMITY		Y	1	-	-	-	-	-	-	-	-	-	20
9	JK	197815			BANKART LESION		Y	6	-	-	-	-	-	-	-	-	-	20
10	SK	274545			BANKART LESION		Y	2	-	-	-	-	-	-	-	-	-	35
11	NS	288304		depression in humerus	hill sachs and bankart	ANTEROINFERIOR LABRAL TEAR	Y	1	-	-	-	-	-	-	-	-	-	35
12	MS	453331			BANKART LESION AND HILL SACHS LESION		Y	6	-	-	-	-	-	-	-	-	-	20
13	D	482768			BANKART LESION AND HILL SACHS LESION		Y	3	-	-	-	-	-	-	-	-	-	20
14	HK	326733		NAD	ROTATOR CUFF TEAR AND BANKART LESION		Y	6	-	-	-	-	-	-	-	-	-	35
15	G	321419		NAD	BANKART LESION.		Y	1	-	-	-	-	-	-	-	-	-	35
16	AS	708226		NAD	chronic bankart lesion and hill sachs lesion		Y	4	-	-	-	-	-	-	-	-	-	20

Sr No	Name	MRD No	Function post op	Function_ 1 month	Function_6 month	Pain_pre op	Pain_post op	Pain_1 month	Pain_6 month	Stability _pre op	Stability_ post op	Stability 1 month	Stability 6 month	Motion pre op	Motion post op	Motion 1 month	Motion 6 month	Total score pre op	Total score post op	Total score 1 month	Total score 6 month	Mean score pre op	Mean score post op	Mean score 1 month	Mean score 6 month	Pre op	Post op	1 month	6 month
1	RS	736486	0	35	50	0	5	10	10	15	30	30	30	0	0	5	5	15	35	80	95	3.75	8.75	20	23.75	Poor	Poor	Good	Excellent
2	RD	398079	20	35	50	0	5	5	10	15	15	30	30	0	0	0	5	35	40	70	95	8.75	10	17.5	23.75	Poor	Poor	Fair	Excellent
3	RB	123650	20	35	50	5	5	5	10	15	15	30	30	0	5	5	10	40	45	75	100	10	11.25	18.75	25	Poor	Poor	Good	Excellent
4	SS	607745	20	35	50	0	5	5	5	15	15	30	30	0	5	10	10	35	45	80	95	8.75	11.25	20	23.75	Poor	Poor	Good	Excellent
5	TS	144772	35	50	50	0	0	5	10	15	15	15	30	5	5	5	10	55	55	75	100	13.75	13.75	18.75	25	Fair	Fair	Good	Excellent
6	BS	485949	0	35	50	5	5	5	5	15	15	30	30	0	5	5	10	55	25	75	95	13.75	6.25	18.75	23.75	Fair	Poor	Good	Excellent
7	PS	273484	20	35	50	5	5	5	0	15	30	30	30	5	5	5	10	60	60	75	90	15	15	18.75	22.5	Fair	Fair	Good	Excellent
8	R	333078	20	35	50	5	5	5	10	15	15	15	30	5	5	5	10	45	45	60	100	11.25	11.25	15	25	Poor	Poor	Fair	Excellent
9	JK	197815	20	35	50	5	5	5	10	15	30	30	30	5	0	5	10	45	55	75	100	11.25	13.75	18.75	25	Poor	Fair	Good	Excellent
10	SK	274545	35	35	50	0	5	5	5	15	30	30	30	0	5	5	5	50	75	75	90	12.5	18.75	18.75	22.5	Poor	Good	Good	Excellent
11	NS	288304	35	50	50	5	5	5	10	15	15	30	30	5	5	10	10	60	60	95	100	15	15	23.75	25	Fair	Fair	Excellent	Excellent
12	MS	453331	20	50	50	0	5	10	10	15	15	15	15	5	0	5	10	40	40	80	85	10	10	20	21.25	Poor	Poor	Good	Good
13	D	482768	20	35	50	0	5	5	5	15	30	30	30	5	5	5	10	40	60	75	95	10	15	18.75	23.75	Poor	Fair	Good	Excellent
14	HK	326733	35	50	50	5	5	10	10	15	30	30	30	5	5	10	10	60	75	100	100	15	18.75	25	25	Fair	Good	Excellent	Excellent
15	G	321419	35	35	50	0	5	10	10	15	15	30	30	0	5	5	10	50	60	80	100	12.5	15	20	25	Poor	Fair	Good	Excellent
16	AS	708226	20	35	50	5	5	5	10	15	15	30	30	5	5	5	10	45	45	75	100	11.25	11.25	18.75	25	Poor	Poor	Good	Excellent

Baba Farid University
of Health Sciences
Sadiq Road
Faridkot-151 203 (Pb). INDIA.
Phone : 01639-256232,256236
Tele/Fax : 01639-256235
Email – Examination@bfuhs.ac.in

No. BFUHS/2K18p-TH/ 1571-9 Date 12/11/18

The Principal,
DMC, Ludhiana.

Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 31.08.2018 has approved the plan of thesis of Rajul Goel, a student of your college for **MS Orthopaedics** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Outcome of arthroscopic bankart's repair in anterior shoulder instability

Supervisor
Dr. Rajnish Garg
Prof. & HWWead,
Dept. of Orthopaedics,
DMCH, Ludhiana.

Co-Supervisor
Dr. Pankaj Mahindra
Assoc. Prof.,
Dept. of Orthopaedics,
DMCH, Ludhiana..

The student may submit the four copies of thesis, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

35. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*
36. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

Candidate's Name:
Department:

CHECK LIST OF PLAN OF THESIS SUBMISSION

- Page number to be serially marked at **bottom right hand corner** of the page

	Yes	No
6.1 Need for Study	☐	☐
6.2 Review of Literature	☐	☐
6.3 AIMs and Objectives	☐	☐
7.0 Material & Methods:	☐	☐
7.1 Source of Data	☐	☐
7.2 Methods of Collection of Data(check point wise)		
• Inclusion Criterion	☐	☐
• Exclusion Criterion	☐	☐
• Duration of Study/Number of cases	☐	☐
• Outcome	☐	☐
• Statistical Analysis (Name of the method in plan)	☐	☐
7.3 The study requires interventions to be conducted on patients	☐	☐
7.4 Ethical clearance certificate attached	☐	☐
8. List of References (Vancouver Style – Start on New page)	☐	☐
9. Proforma signature of Supervisor/Candidate every page	☐	☐
10. Departmental Clearance Certificate	☐	☐
11. Cost Certificate	☐	☐
12 Record Certificate	☐	☐
13 Consent certificate by Supervisor/Co-Supervisor	☐	☐
• Consent forms		
English	☐	☐
Hindi	☐	☐
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- The Numerical marked in the checklist should be incorporated in Plan

Note: Same title thesis should not have been done in BFUHS in last 5 years

(Signature of Supervisor) **(Signature of Candidate)**

OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SURGERY

IN

ORTHOPAEDICS

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

JANUARY, 2018

DR. RAJUL GOEL

DEPARTMENT OF ORTHOPAEDICS

DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY
For the degree of	MS ORTHOPAEDICS
Name of the candidate	DR. RAJUL GOEL
Supervisor	DR. RAJNISH GARG
Co-supervisors	DR PANKAJ MAHINDRA
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: avulsion of labrum from glenoid rim is known as Bankart's lesion

Aim: Outcome of arthroscopic Bankart's repair in anterior shoulder instability

Material & Methods: . A prospective and retrospective review of the medical records of all cases of shoulder instability due to Bankart's lesion who will undergo fixation between January 2016 and May 2019 at Dayanand Medical college Hospital, Ludhiana will be performed

Clinical Significance: Traumatic anterior instability is the most common form of glenohumeral instability and nearly all traumatic anterior instabilities consist of Bankart's lesion

Keywords: Bankart's lesion , suture anchors

(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY"** exist in the Department of Orthopaedics, DMC&H, Ludhiana, and will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate himself/herself under our supervision and guidance.

SUPERVISOR:

DR. RAJNISH GARG
Professor & Head
Department of Orthopaedics
DMC&H, Ludhiana

CO-SUPERVISOR:

DR. PANKAJ MAHINDRA
Associate Professor
Department of Orthopaedics
DMC&H, Ludhiana

DR. RAJNISH GARG
Professor & Head
Department of Orthopaedics
DMCH, Ludhiana

Place: Ludhiana

Date: 19/1/18

APPROVAL PROFORMA
BY RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	DR. RAJUL GOEL
Department	ORTHOPAEDICS
Topic of Thesis	OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY
Likely date of appearing in PG examination	MAY/JUNE 2020
Date of enrollment	31.05.2017
Name of Head of Department	DR. RAJNISH GARG
1. **Supervisor** 2. **Co-Supervisor**	DR. RAJNISH GARG DR. PANKAJ MAHINDRA
Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
1. HOD Pharmacology	1. HOD Physiology
2. HOD Surgery	2. HOD Pathology
3. HOD Pathology	3. HOD Pharmacology
4. HOD Medicine	4. HOD SPM
5. Dean Academics	5. HOD Medicine
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	7. HOD Obst. & Gynae
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	10. Dean Academics
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	12. Principal

Approved: Yes / No

Chairperson
Research Committee

Chairperson
Research Committee

Approved: Yes / No

Chairperson
Ethics Committee

Chairperson,
Ethics Committee

BABA FARID UNIVERSITY OF HEALTH SCIENCES FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	DR. RAJUL GOEL H. NO. 1549, SECTOR 21, HUDA , KAITHAL (136027), HARYANA
2	NAME OF THE INSTITUTE	DAYANAND MEDICAL COLLEGE AND HOSPITAL, LUDHIANA
3	COURSE OF STUDY AND SUBJECT	MASTER OF SURGERY, ORTHOPAEDICS
4	DATE OF ADMISSION OF COURSE	31st May, 2017
5	TITLE OF THE TOPIC	OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY

6. BRIEF RESUME OF INTENDED WORK:

6.1 NEED FOR STUDY

Anterior instability is the most common form of shoulder instability.[1] recurrent anterior shoulder instability results in functional disability for patient , in terms of both shoulder function and general health status.[2] Once reserved for cases of recurrent dislocation, stabilization surgery is now being performed after primary dislocation on patients thought to be at high risk of recurrences. Recurrent shoulder dislocation is common in young athletes as these injuries often occur during sports. Hence it is very clear that this type of injury prevents the individual from returning to those activities and therefore demands a meticulous restoration of function to resume his/her normal life. After arthrocopic Bankart's repair, Patients are able to have a good range of motion functionally, especially external rotation, which allows them to return to their sports or high-demand jobs.[3-5]

This dates back to 20th century when perthes and Bankart's described avulsion of this anterior labrum from glenoid rim. in the present era evolvement of arthroscopic techniques, The arthroscopic Bankart's repair offers minimally invasive approach with less surgical trauma and blood loss, with improvements in operating time, perioperative morbidity, narcotic use, hospital stay, time loss from work, and decrease number of complications together with a lower cost of surgery.[6-8] Satisfactory stabilization has been accomplished with open anterior capsulolabral reconstructions such as the Bankart's procedure.[9-11] However, difficulty in achieving strength and in returning to daily activities as well as a decreased range of motion following

open Bankart's procedures has led to the development of arthroscopic stabilization techniques.

Considering all above factors and various studies treatment of anterior shoulder instability with arthroscopic placement of suture anchors is becoming primary surgical option in patients with anterior instability.

Detachment of the antero-inferior labrum (the Bankart's lesion) facilitates recurrent anterior instability. The socket-deepening effect of the glenoid labrum has been proved to be an important factor in maintaining stability.[12,13] Reattaching the labrum onto the articular surface restores its socket-deepening bumper effect. This is accomplished using sutures and suture anchors, which can be done either open or arthroscopically.[13,14] Capsular laxity is the other reason for glenohumeral instability. Lack of diagnosing and treating variable capsular laxity accompanying Bankart's lesions may cause failure of repair.[15,16] For a perfect shoulder instability repair result, all the facts causing instability must be understood and treated appropriately.

From the earlier recurrence rate of 34 % arthroscopic surgery has now been reported with recurrence rates as low as 4 %. Shoulder joint in our body has most wide range of motion but also increased predisposition to dislocations. 50 % of all dislocations are shoulder dislocations of which 85-95 % are anterior due to its biomechanics and less bony stability. Rowe and Zarins reported a rate of 95.6% traumatic origin to anterior dislocation in their study that included 500 patients.[17] also recurrence is relevant with age at which first dislocation occurred, closed reduction methods, immobilization time, severity of trauma, accompanied fracture and soft tissue damage.

Traumatic anterior instability is the most common form of glenohumeral instability and nearly all traumatic anterior instabilities consist of Bankart's lesion. in nut shell avulsion of labrum from glenoid rim is known as Bankart's lesion.[18]

6.2 REVIEW OF LITERATURE

Godinho et al conducted a study to evaluate the clinical outcome of arthroscopic rotator cuff fixation and, when present, simultaneous repair of the Bankart's lesion caused by traumatic dislocation; and to assess whether the size of the rotator cuff injury caused by traumatic dislocation has any influence on the postoperative clinical outcomes. Thirty-three patients with traumatic shoulder dislocation and complete rotator cuff injury, with at least two years of follow up, were retrospectively evaluated. For analysis purposes, the patients were divided into groups: presence of fixed Bankart's lesion or absence of this lesion, and rotator cuff lesions smaller than 3.0 cm (group A) or greater than or equal to 3.0 cm (group B). All the patients underwent arthroscopic repair of the lesions and were evaluated postoperatively by means of the UCLA (University of California at Los Angeles) score and strength measurements. The group with Bankart's lesion repair had a postoperative UCLA score of 33.96, while the score of the group without Bankart's lesion was 33.7, without statistical significance ($p = 0.743$). Group A had a postoperative UCLA score of 34.35 and group B, 33.15, without statistical significance ($p = 0.416$).he functional outcomes of the patients who only presented complete rotator cuff tearing after traumatic shoulder dislocation, which underwent arthroscopic repair, were similar to the outcomes of those who presented an associated with a Bankart's lesion that was corrected simultaneously with the rotator cuff injury. The extent of the original rotator cuff injury did not alter the functional results in the postoperative evaluation.[19]

Bonnevialle et al conducted a study to evaluate mid-term outcomes of Bankart's repair with Hill-Sachs remplissage (BHSR) and to highlight

prognostic factors of failure. Thirty-four patients operated on for anterior shoulder instability with BHSR were enrolled in a prospective non-randomised study. Clinical and radiographic evaluation was performed at 1.5, three, six months and yearly thereafter. Outcome measures included Rowe and Walch-Duplay score.At mean follow-up of 35 months (24-63), the Rowe and Walch-Duplay scores reached respectively 92.7 and 88.2 points. The mean deficit in external rotation was 6° in ER1 and 1° in ER2 ($p = 0.4$, $p = 0.9$ respectively). Five patients (14.7%) had a recurrence of instability and three others had a persistent anterior apprehension. In the failure group, the Hill-Sachs lesion was deeper (26% vs 19% of the humeral diameter; $p = 0.04$) and range of motion at 1.5 months postoperatively was greater. Age at surgery, pre-operative instability severity index score (ISIS), hyperlaxity, type and level of sport, amount of glenoid bone loss had no correlation with failure rate. The rate of failure at mid-term follow-up of BHSR was higher than commonly reported. The premature recovery of range of motion seems to be a clinical sign of failure at follow-up. Moreover, in case of deep Hill-Sachs lesion (>20%) an alternative procedure should be considered.[20]

Kalkar I et al conducted a study to evaluate the results of patients with recurrent anterior shoulder dislocation, who had been treated with repair of the Bankart's lesion without capsular plication. The study included 22 shoulders of 22 patients (16 males and 6 females) with a mean age of 28 years, who underwent Bankart's repair between 2011 and 2014. Patients with bilateral shoulder instability, multiple instability, >25% glenoid bone loss, and those with a history of shoulder surgery were not included in the study. The average follow-up time was 21.2 months. Evaluation was made of the

preoperative number of dislocations, postoperative recurrence, functional status, and daily activity performance of the patients. Shoulder range of motion was measured. The results were evaluated using the Rowe shoulder score and the Oxford shoulder instability score. Recurrence was observed in only one patient who had a shoulder dislocation after trauma, thus giving a recurrence rate of 4.5%. Shoulder range of motion was full in all except that one patient. The mean Rowe shoulder score was 95.5 (excellent) and Oxford shoulder stability score was 44.6 (excellent).No recurrent shoulder dislocation was observed in patients who underwent Bankart's repair surgery. Plication was not performed with the Bankart's repair. Close to full range of motion was obtained in all patients. In conclusion, Bankart's repair alone can be considered to be sufficient for the treatment of traumatic recurrent anterior shoulder instability.[21]

Erkoçak ÖF et al conducted a study to evaluate the functional results of arthroscopic Bankart's repair in patients with posttraumatic recurrent anterior glenohumeral instability .Forty one patients (6 female, 35 male; mean age 24.4; range 19 to 39 years) underwent arthroscopic Bankart's repair with knotless anchors for posttraumatic recurrent anterior glenohumeral instability. The mean age that first dislocation occured was 22.3 (range 16 to 36 years old). Involvement was on the right side in 27 patients, on the left in 14 patients, and on the dominant side in 32 patients. Pre and postoperative evaluations included detailed physical examination, assessment with the Rowe and Constant scale for shoulder functions, anteroposterior and axillary radiographs, routinely arthro-CT and arthro-MRI. Postoperatively the mean follow up was 29.8 months (range to 6 to 62 months). According to Rowe

score, the results were excellent in 31 patients (75.7%), good in 6 patients (14.6%), fair in 3 patients (7.3%) and poor in 1 (2.4%) patients. The mean preoperative Rowe score was 20.1, which increased postoperatively 89.1. Preoperative mean Constant scale was 64.2 and 87.6 postoperatively. The mean preoperative active external rotation was 45°, which decreased postoperatively to 40° respectively ($p<0.05$). Thirty seven (90.2%) patients were satisfied with the operation. The patient with the poor result developed redislocation postoperatively seventh month due to epileptic seizure. This study shows arthroscopic Bankart's repair with knotless anchors for recurrent anterior glenohumeral instability is a useful and successful procedure.[22]

Carreira DS et al conducted a study To prospectively evaluate results of arthroscopic Bankart's repairs at a minimum 2-year follow-up for patients with histories of shoulder dislocation and an anterior-inferior labral tear at the time of diagnostic arthroscopy.A consecutive series of 85 patients (70 men, 15 women; mean age, 26 years) with Bankart's lesions were treated with arthroscopic repair using suture anchors; 18 patients (27%) had extension of the labral injury into the superior labrum affecting some or all of the biceps anchor. Anchors were loaded with no. 2 nonabsorbable braided suture and placed 2 mm into the edge of the glenoid surface. A low anterior (5-o'clock) portal through the subscapularis tendon was used in all patients; 72 patients were evaluated at a minimum of 2 years postoperatively (mean, 46 months).Seven patients (10%) experienced recurrent instability after repair. Four patients had redislocations; 3 experienced recurrent subluxations. One patient had pain with the apprehension test without a clear history of recurrent instability. Of 18 collision athletes, 2 had dislocations at 22 and 60 months

postoperatively. There were no complications, including no neurologic deficits. Clinical strength testing of the subscapularis muscle was normal in all patients. The mean Rowe score was 88 of 100 points, with 90% excellent or good results. Simple Shoulder Test responses improved from 66% positive preoperatively to 88% positive postoperatively. The American Shoulder and Elbow Surgeons scoring index averaged 92 of 100 points postoperatively. Pain analog scales improved from 5.5 preoperatively to 0.35 postoperatively on a 10-point scale. SF-12 scores improved for physical function. Patient satisfaction was rated 8.9 on a 10-point visual analog scale. Bankart's repairs performed arthroscopically using properly implanted suture anchors and nonabsorbable sutures and in which associated pathoanatomy is addressed demonstrate low recurrence rates (10%) similar to historical open controls.[23]

6.3 AIMS AND OBJECTIVES OF THE STUDY

- To evaluate functional outcome after arthroscopic Bankart's repair in anterior shoulder instability.
- To assess complications after arthroscopic Bankart's repair.

7.0 MATERIALS AND METHODS

7.1 SOURCE OF DATA

The purpose of our study is to review and analyses the functional outcome of anterior shoulder instability managed with arthroscopic Bankart's repair. A prospective and retrospective review of the medical records of all cases of shoulder instability due to Bankart's lesion who will undergo fixation between Jan 2016 and May 2019 at Dayanand Medical college Hospital, Ludhiana will be performed.

7.2 METHOD OF COLLECTION OF DATA

Inclusion Criteria:

- Recurrent anterior glenohumeral subluxation or dislocation after an initial episode of traumatic anterior shoulder dislocation,
- A Bankart's lesion confirmed by arthroscopic examination or ultrasound or Magnetic resonance imaging (MRI)
- Arthroscopic Bankart's repair done using bio-absorbable suture anchors.

C. Exclusion Criteria:

- Posterior instability
- Multidirectional instability,
- Procedures performed with open surgery
- Patient who did not consent for surgery
- Patient who did not follow up.
- Patient managed conservatively

Medical records will be studied to obtain demographic data including patient age and gender, mechanism of injury, date of injury, date of surgery. Operative reports will be reviewed to determine the specific fixation technique.

In the cases, information will be obtained from the documentation in the follow-up records. The follow-up information also included occurrence of late complication or the need for additional surgery including implant removal. The duration and physiotherapy programme followed will be noted. The minimum period of follow-up will be 1 month and maximum period 6 month. Patients will be assessed as per the Rowe scoring system. Presence of pain will be quantified as excellent, good, fair, poor using the Rowe scoring system. Ability to perform functions like external rotation, internal rotation and elevation. Check radiographs consisting of standard anteroposterior and lateral views, Y Views wherever necessary will be made and evaluated.

The final functional outcome will be graded as Excellent (Score 90 to 100). Good (Score 75 to 89). Fair (Score 51 to 74) and poor (Score below 50) and documented in the shoulder rating sheet as per the Rowe scoring system.

OUTCOME

The final functional outcome will be graded as Excellent (Score 90 to 100). Good (Score 75 to 89). Fair (Score 51 to 74) and poor (Score below 50) and documented in the shoulder rating sheet as per the Rowe scoring system.

STATISTICAL ANALYSIS

The data collected will be recorded in a proforma and will be analyzed using appropriate observational statistical methods.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

No

7.4 Has the ethical clearance been obtained from ethical committee of your Institution in case of 7.3?

Yes, attached herewith.

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PROFORMA

NAME : AGE SEX

MRD NO ADMISSION NO

DATE OF ADMISSION

DATE OF INJURY

MECHANISM OF INJURY

DATE OF FIRST DISLOCATION

RECURRENT DISLOCATION : TOTAL NUMBER TIME

DATE OF FIRST CONSULTATION

DATE OF SURGERY

DETAILS OF PATIENT:

PROFESSION: LABOURER/ATHLETE

/HOUSEWIFE/AGRICULTARIST/DRIVER/UNEMPLOYED/OTHER

NO. OF SUTURES USED

CLINICAL EXAMINATION :

APPREHENSION TEST

FULCRUM TEST

DRAWER TEST

RADIOLOGICAL EXAMINATION :

XRAY FINDINGS

MRI FINDINGS

INTRA OPERATIVE FINDINGS:

PHYSIOTHERAPY TAKEN (Y/N): DURATION

Signature of Candidate **Signature of Supervisor**

COMPLICATIONS:	YES/NO
NERVE INJURY (TEMPORARY / PERMANENT)	
INFECTION	
LOOSENING IMPLANT	
MIGRATION OF IMPLANT	
BREAKAGE OF IMPLANT	
RECURRENT INSTABILITY	
STIFFNESS	
INFLAMMATORY REACTION	
OSTEOARTHRITIS	

Signature of Candidate **Signature of Supervisor**

ROWE Score

• Criteria• Findings Criteria	Findings	Score	0 Month	6 Month	1 year
Function					
	No limitation of work or sports, little or no discomfort (eg shoulder strong overhead, lifting, swimming, throwing, tennis)	50			
	Mild limitation and minimum discomfort	35			
	Moderate limitation and discomfort	20			
	Marked limitation and pain	0			
Pain					
	None	10			
	Moderate	5			
	Severe	0			
Stability					
	No Recurrence, subluxation or apprehension	30			
	Apprehension when placing arm in certain positions	15			
	Subluxation (not requiring reduction)	0			
Motion					
	100% of normal ext rotation, int rotation and elevation	10			
	25% loss of motion in any plane	5			
	More than 25% loss of motion in any plane	0			
Total Score					
Mean Score					

90 to 100= excellent, 70-89= Good, 40-69= fair, < 39=poor

Signature of Candidate **Signature of Supervisor**

CERTIFICATE OF DEPARTMENTAL CLEARANCE

This is to certify that the plan of thesis entitled '**OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY**' has been discussed in the Department of ORTHOPAEDICS and approved by whole of the faculty of the department. The plan writing is satisfactory.

SUPERVISOR:

DR. RAJNISH GARG
Professor & Head
Department of Orthopaedics
DMC&H, Ludhiana

CO-SUPERVISOR:

DR. PANKAJ MAHINDRA
Associate Professor
Department of Orthopaedics
DMC&H, Ludhiana

DR. RAJNISH GARG
Professor & Head
Department of Orthopaedics
DMCH, Ludhiana

DAYANAND MEDICAL COLLEGE & HOSPITAL
LUDHIANA

Ref. No: DMCH

Dated: 19/1/15

TO WHOM IT MAY CONCERN

Certified that the study **'OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY'** involves only such investigations and / or treatment, which are relevant in the management of patients and has no extra cost implications to the patient.

Name of candidate: Dr. Rajul Goel

Supervisor: Dr. Rajnish Garg

Co-Supervisor(s): Dr. Pankaj Mahindra

Signature of candidate

Signature of Supervisor

DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Ref.No. DMCH

Dated: 19/1/18

TO WHOM IT MAY CONCERN

I shall carry out the study **'OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY'** meticulously and shall maintain the records for 5 years after the submission of thesis and present them to any competent authority as and when required. The following documents will be preserved:

- List of enrolled patients with identification details
- Consent forms of all the enrolled patients
- Proforma of each patient with verifiable details, individually signed by supervisor.

Dr. Rajul Goel
P.G. Resident
Dept. of Orthopaedics
DMC & Hospital, Ludhiana

CERTIFICATE

We hereby certify that the informed patient consent form and its translation and back translation to Hindi and Punjabi are accurate to the best of our knowledge and satisfaction.

SUPERVISOR:

DR. RAJNISH GARG
Professor & Head
Department of Orthopaedics
DMC&H, Ludhiana

CO-SUPERVISOR:

DR. PANKAJ MAHINDRA
Associate Professor
Department of Orthopaedics
DMC&H, Ludhiana

Dr. Rajul Goel
P.G. Resident
Dept. of Orthopaedics
DMC & Hospital, Ludhiana

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____ निवासी _____ इस शोधकार्य **"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o.....

am willing to participate in the study **"OUTCOME OF ARTHROSCOPIC BANKART'S REPAIR IN ANTERIOR SHOULDER INSTABILITY"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

.....
Signature of the Witness

Name:

.....
Signature of the patient

Signature of Candidate

Signature of Supervisor